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CONSTRUCTION • OPERATIONS • MAINTENANCE

PIPE LINE INDUSTRY

AUGUST
1957

AUG 28 1957

NEW CONSTRUCTION IDEAS
Longest Pull in 300-Foot Water 37

MODERN FIRE PREVENTION
Here's How to Handle Jet Fuels 45

ENGINEERING TIME-SAVERS
Find Pressure Drops by Nomogram 50

OPERATIONS HANDBOOK
How to Select Mechanical Seals 55

DON'T BE GUILTY
25 Ways to Ruin a Good Meeting 60

TODAY'S METHODS
Centralized Training Gets Results 63

For a "Quick Look" at this issue, turn the page . .

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(A) The majority of incoming liquid and solid particles are directed down into reservoir. 1

(B) Lighter solid particles carried by gas stream are separated on surfaces of contactor which are kept wet and clean by revolving thru liquid reservoir. 2

(C) Contactor is revolved by explosion-proof gear motor.

(D) Mist Extractor removes any remaining liquid particles from gas stream prior to outlet. 3

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PIPE LINE INDUSTRY

CONTENTS and Quick Look

August, 1957 Vol. 7, No. 2

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Seven Mile Line Laid in 300 Feet of Water

☐ This complete pictorial report of the pulling of a 22-inch sludge outfall line built for the City of Los Angeles covers the first test of a number of new developments in submarine pipe line construction. Two giant anchors set in 660 feet of water nine miles out provided an estimated million pounds of holding force for the "Friction Transposition" method. Pipe was coated both inside and out with concrete, epoxy sleeves protected the inside of the joints. A double-decker launchway and underwater television cameras were other pipe line firsts in this successful project.

By Gilbert M. Wilson.....Page 37

Safe Handling And Storage of Jet Fuels

☐ Here is an article that will take much of the mystery out of jet fuels in pipe line operations. A thorough knowledge of the burning characteristics given in a handy graph will help you to handle and store these products safely.

By J. L. Risinger.....Page 45

Liquid and Gas ΔP by Nomogram

☐ Here is a set of nomographs that will save time and effort in making fluid flow calculations. With them you can handle gas, crude or a variety of products. One will also prove useful in determining the specific volumes of gases or vapors.

By R. W. Fluornoy.....Page 50

Find Beam Deflections by Easy Methods (Part 3)

☐ These short cuts will save the design engineer's time in solving problems involving applied couples and restrained beams. Earlier sections covered areas of moment diagrams, deflection of simple beams under a uniform load and under constant load, and cantilever beams uniformly loaded.

By Charles H. Fork.....Page 53

Facts About Pump Packings and Seals (Part 3)

☐ Here is a handbook full of useful ideas for solving centrifugal pump shaft seal problems. Description of the design features of several types of mechanicals will help you to select the right one for your particular pump application. Installation and maintenance tips can save time and money, too.

By Harold Woodhouse.....Page 55

25 Ways to Ruin a Meeting

☐ Here is the backward approach to conducting a successful meeting. Instead of using the usual "do's", the author outlines 25 sure "rules to ruin" for a pipe line meeting leader. Be sure to check these rules, some may elicit that guilty feeling!

By J. Damon Quinton.....Page 60

How 50 Oil Companies Train Employes

☐ More than half of the larger companies surveyed said they are using central training sections. Are they paying their way? How are they organized and operated? These two questions are answered in full in this comprehensive survey report.

By Carl Mullins White.....Page 63

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Word to the Wise

This is a chronicle of *good* pipe line public relations.

Although the following example describes just one public relations idea, it is an excellent one. The project is easy to carry out and relatively inexpensive. It can be used to great advantage by any pipe line company, large or small.

Last summer, Magnolia Pipe Line Company invited Dr. Paul D. Zook, associate professor of Marketing and economics at Southern Methodist University, to come out on the line and learn the pipe line business from actual experience. Dr. Zook's comments on what he learned and what this meant to students and future business men are as follows:

"I have two graduate degrees in economics, with a major in transportation—and have taught university transportation courses. But, before taking the Magnolia tour, my knowledge of pipe lines was strictly academic. Magnolia's management felt that greater understanding of the industry would help clear up frequently incomplete and inaccurate information about their operations and problems. These pipe line leaders were convinced that giving educators a first hand look at their operations would contribute greatly to the quality of education in the college classroom.

"My observations of pipe line activities as they were planned by Magnolia were not made from a desk in Dallas; this was not an occasion to study statistics of pipe line performance or delve into company records collected in rows of file cabinets. I was sent into the field and was told to wear khakis.

"During the visit I met pipe line personnel of every grade, including assistant district superintendents, chief gagers, field gagers, connection foremen, line walkers and division superintendents.

"Of what worth was this experience? First, I gained some knowledge of pipe line economics. To use but one illustration—I already knew that by legislation, upheld by court decision, pipe lines are common carriers. My summer observations taught me that a variety of commodities owned by several companies can be carried in one line and retain their identity.

Such observations of common carrier operations convinced me that the Supreme Court decision notwithstanding, pipe line companies are to a substantial degree not common carriers. They are, in effect, to a large extent private carriers performing one phase of an integrated operation to provide oil products to consumers.

"Secondly, the experience provided me with an insight into the attitudes and ethics of a large pipe line company. My observations reminded me that the moral character of a business is reflected by the men who operate it; this includes all of the supervisory force from the president and vice president to foremen and chief gagers. I was surprised to learn that these men are quite similar in behavior to non-business men, even educators!

"Lack of contact and communication between people frequently obscures these likenesses and provides a basis for misunderstanding and distrust. For example, concentration on the malfunctioning of business has led students to believe that a single-minded pursuit of profits leads business men into anti-social or even unethical practices.

"By the same token, business men sometimes have been inclined to believe that the attitudes of educators reflect an anti-business bias. To this belief may be added distrust of an individual who is considered to have still a second deficiency, described loosely as never having met a payroll.

"Such beliefs lead to a critical view of the judgement and leadership of college professors in teaching future business men.

"No doubt the misunderstanding which these divergent views have caused has lessened in recent years. This has been the result of more opportunities for each group to become better acquainted with the other.

"Thirdly, in addition to the professional advantages which I gained from my summer's experience, I derived real satisfaction from personal friendships with pipeliners all up and down Magnolia's system. When my visit ended I had completed the cycle from class room to pipe line to classroom. Pipe line operations and problems had become a real experience for me.

"Operations of a large business firm had taken on a new perspective, and with this perspective I am now in a better position to teach future business leaders."

This excellent example of action to improve pipe line industry and educational understanding should do a great deal toward furthering good public relations for the pipe line industry. Not only will Magnolia and Southern Methodist University, their employes and students, benefit from this relationship, but such steps should go a long way toward building better understanding of the truth about oil industry operations.

This is certainly not the first attempt that oil companies have made to improve the understanding of college educators and students with pipe line operations, nor should it be the last. Future tours and visits by educators could be invaluable in promoting better public understanding.

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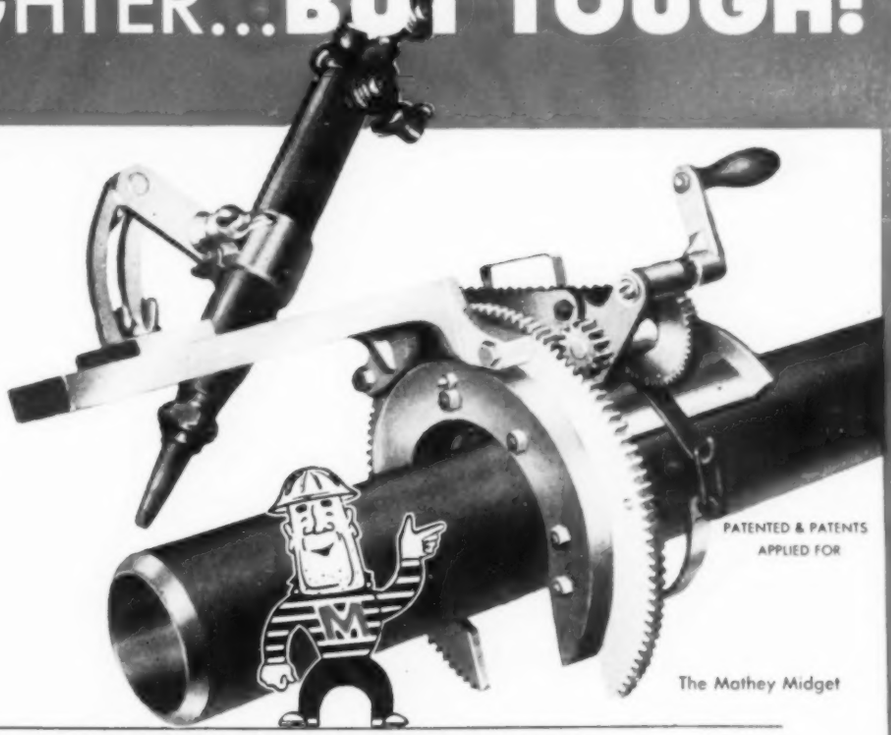

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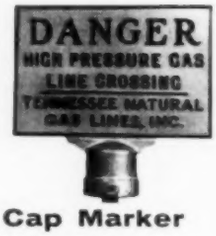

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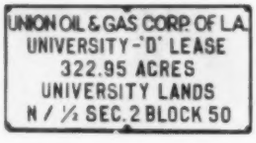

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Indexed by Engineering Index and Industrial Arts Index

BAPTISM OF FIRE FOR THE NEW NO. 572 PIPELAYER

"It is doing a fine job in the roughest possible conditions"

There was no gentle break-in period for the new 86,000-lb.-capacity Caterpillar No. 572 Pipelayer announced in April. On one of its first jobs, it was thrust into steep, mountainous terrain, made slick and dangerous by continual rain, near Elkins, W.Va. How's it doing? Here's the answer from Ralph Gaddy, spread superintendent of Williams-Austin Co., Pittsburgh.

"It is doing a fine job in the roughest possible conditions. The design is right and the engineering is of the best."

On this rough-and-rugged job, the CAT* No. 572 Pipelayer is laying 8½ miles of 26-inch gas line for Columbia Gas System. The line will parallel an existing line starting at the Files' Creek Compressor Station.

This pipelayer needed no babying because it is the product of extensive field tests. It was engineered to produce wherever big-inch takes you. With its 19-inch ground clearance and its 86-inch track gauge, the No. 572 gives you stability in any type of terrain. And it is powered by a dependable Cat Diesel Engine rated at 128 HP at 1,200 RPM.

Operators can work at top efficiency, because the unit was designed to make their job easier and safer. The No. 572 has in-seat starting. Controls are located for convenience and positioned for frequency of use.

Here's the perfect machine to team up with the 130,000-lb.-capacity No. 583. Call your Caterpillar Dealer soon. He'll demonstrate it on *your* job . . . at *your* convenience.

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The new TUBE-TURN Taper Face Flanges are being used by progressive City Gas Company, Flemington, N. J., for its fast-growing distribution system. Mr. L. B. Pettit, Manager, says: "We find these new flanges a good saving and good insurance against leakage. We use TUBE-TURN products exclusively." Full details in Bulletin 821 . . . free on request.

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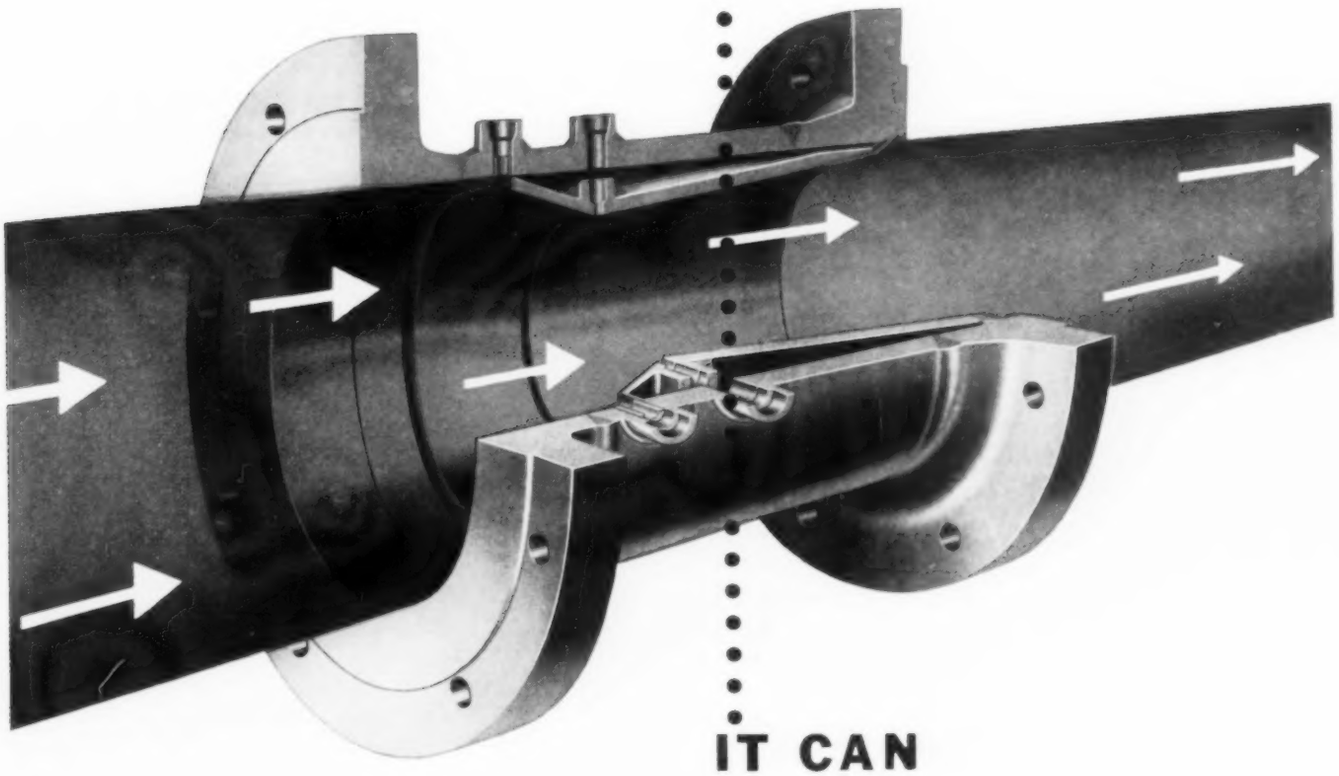

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The Dall Flow Tube operates with the lowest head loss obtainable with any known velocity-increasing differential producer. This flow measuring device is unsurpassed for differential pressure recovery . . . with consequent savings in pumping and transmission costs. These advantages apply over a full range of throat-to-line diameter ratios. Besides providing a maximum in power savings, additional savings can be realized at initial installations. A single Dall Flow Tube can replace several parallel large orifice runs requiring longer approach sections of straight pipe.

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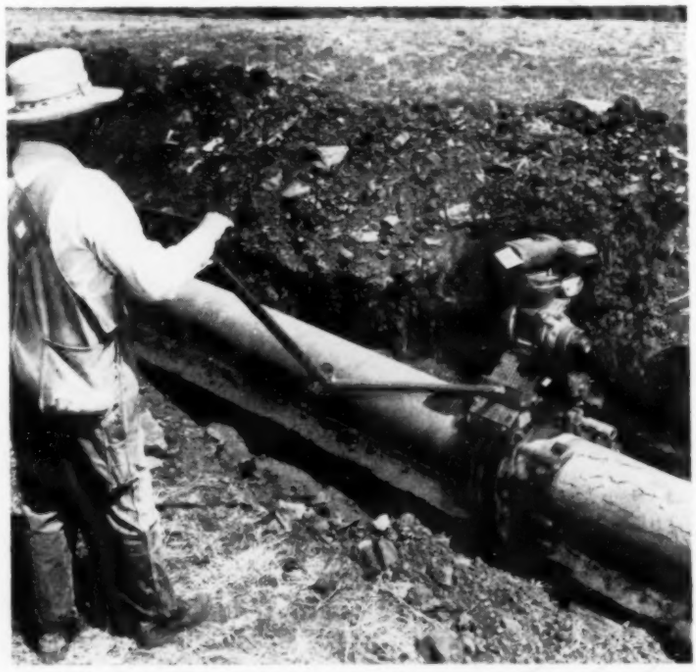
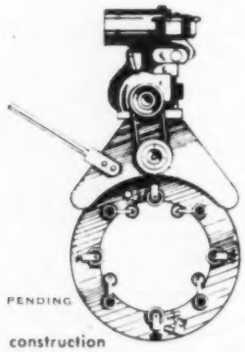
cleans loaded oil, gas and products lines faster and easier!

In actual field operations this new, lightweight, vibrationless Remco Pipe Cleaner has cleaned pipe 10 times faster than any other method. Ideal for use where weight and vibration are a hazard and where service cannot be interrupted, this new machine requires only 6" of clearance under the line. Completely self-propelled, it uses standard knives, cutters and brushes and leaves the pipe clean enough for the applicaiton of hot dopes, primers and tapes. Forward speed (0 to 60' per min.) and rotation of the head (125 rpm) are completely independent. This enables operator to completely control the quality of the cleaning operation.

Whatever your pipe maintenance problems, this new Remco machine will provide an inexpensive answer.



Easily mounted by two men in a matter of minutes, the Remco Pipe Cleaning Machine can be operated by one man. Cleaning head is centered by calibration marks on the head ring and is securely fastened by a positive locking device. The separate power unit is then mounted to the head.



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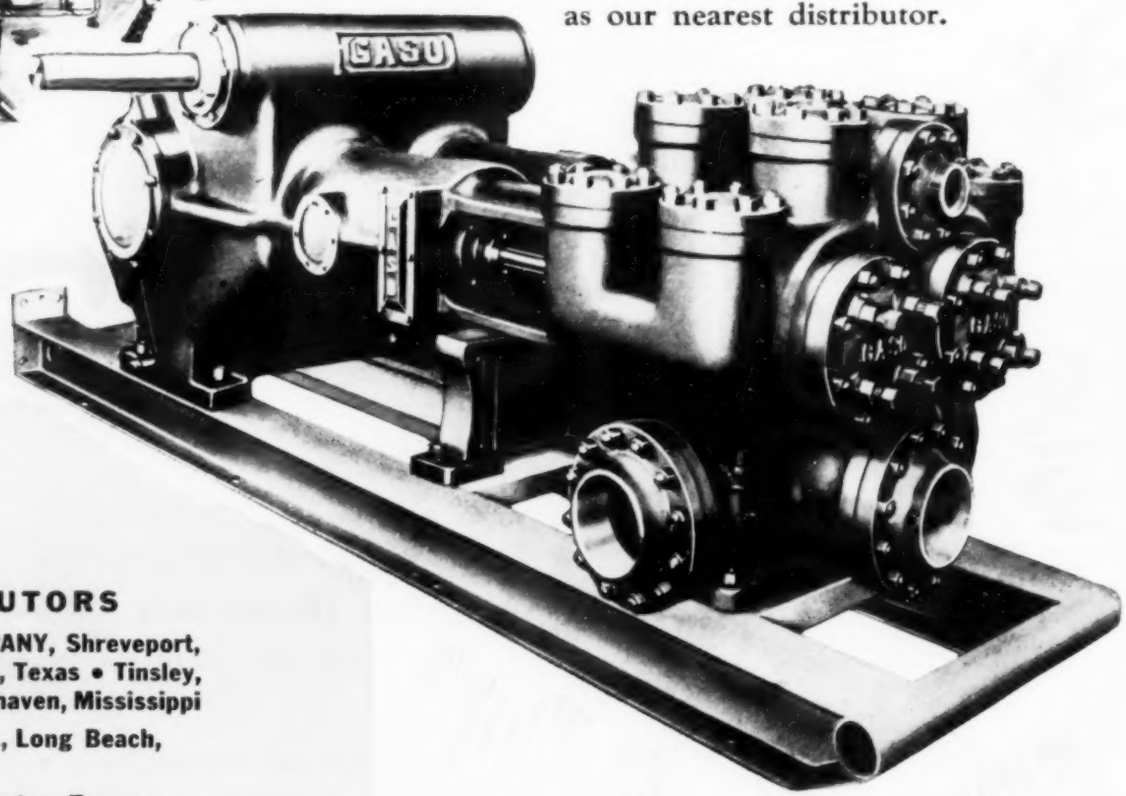

Fig. 2651-2652 — Gaso 12" stroke Duplex Piston Power Pump. Largest of Gaso models designed to pump oil or water through long lines at pressures from 475 to 1500 psi.

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"Wet" spring and swampy

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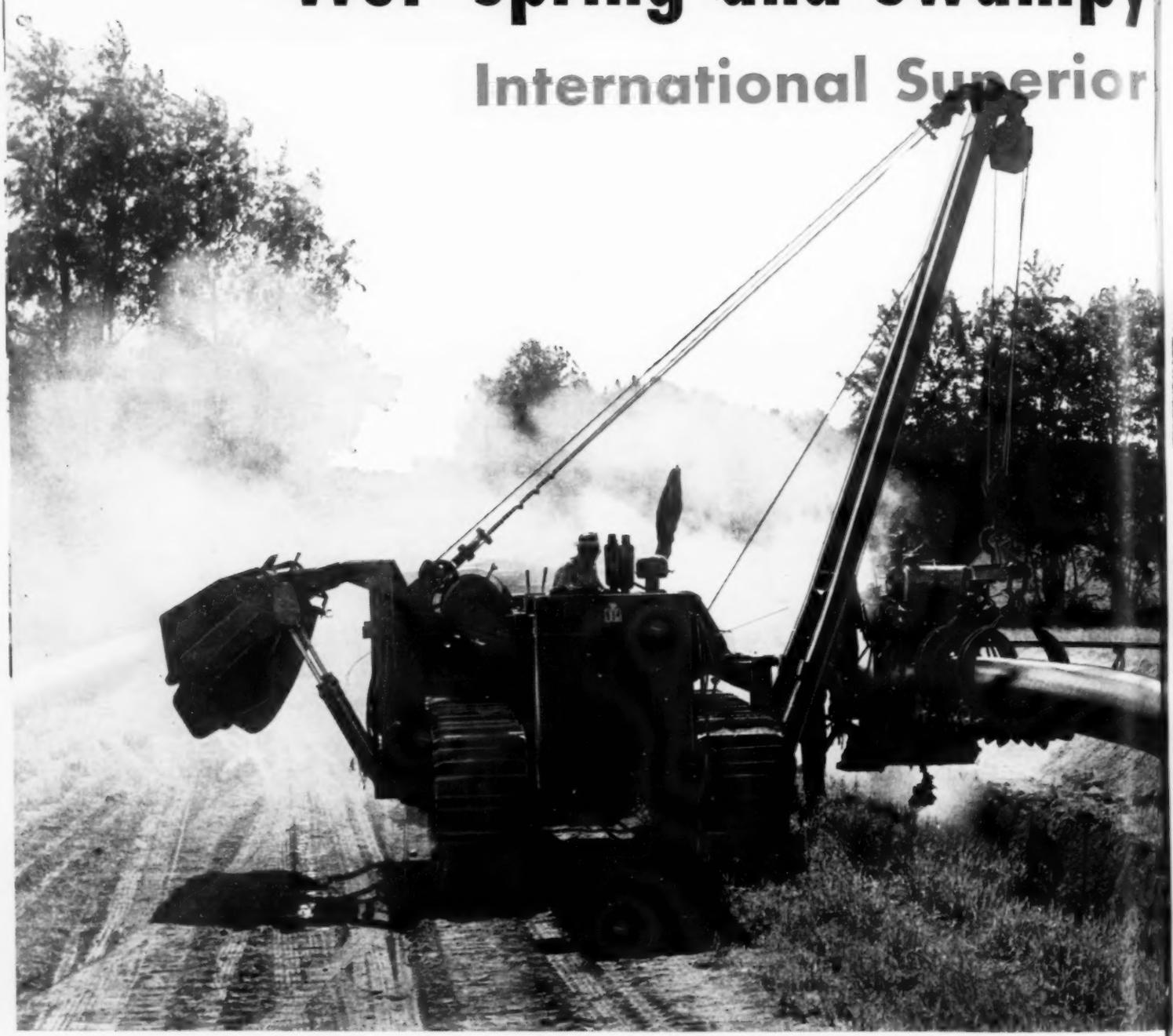


Treading inches-close to the trench through a peat bog, two International Superior TD-18 sidebooms help lower the weighted pipe.

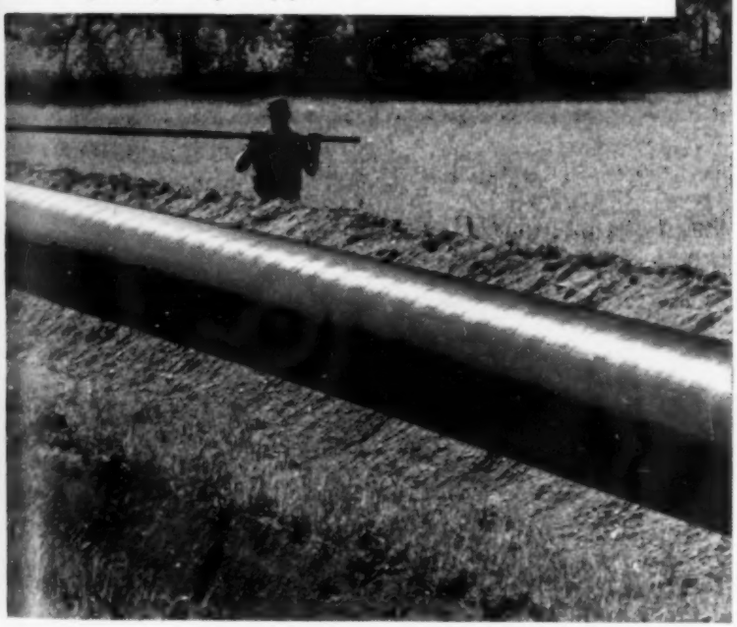
One of the two International Superior TD-14 sidebooms in the No. 1 spread works with the tie-in crew at one of the many road crossings.

terrain beaten by

Sideboom Fleet

for O. R. Burden Construction Corporation, Tulsa, Oklahoma

Spread Supt. F. W. Lewis makes up for rain delays by using this TD-24 sideboom to cradle pipe for doping and wrapping, after which the coated pipe is lowered directly into the trench in the same operation. A second TD-24 sideboom precedes this unit cleaning and priming the pipe.



One of three International-powered bending, boring, and backfilling machines in the spread included this CRC bending machine, driven by an economical 4-cylinder U-6 carbureted power unit.

Indiana's wettest spring in years dealt O. R. Burden Construction Corporation a twin blow! It set back by a month the kick-off to lay a 20-inch crude line from Schererville, Indiana, to Cygnet, Ohio, for Tecumseh Pipeline Co. It slowed down daily construction by 30%, when the job did start.

But now, a fleet of seven world-proven International Superior sidebooms is helping this pipeliner make up time—despite abnormal numbers of road and creek crossings, plus peat bog complications!

For example, Burden gets time-saving, capacity-adding maneuverability and precision load control that no other boom unit delivers from two TD-24 crawler tractors on the cleaning-priming, and doping-wrapping-lowering-in operations. Famous Planet Power steering lets these operators "feed" full-time live power to both tracks, straightaway or on the turns—for positive traction and "no-jerk" steering. Exclusive TD-24 finger-tip hydraulic braking, and foot decelerator action, provide positive pipe-carrying control over any terrain—with exact regulation of tractor travel. And the Burden operators attain amazing inch-close accuracy of boom-action control with minimum effort on grouped, reach-easy control levers.

The TD-18 and TD-14 International Superior boom tractors are proving equally helpful with level-treading, bog-beating track flotation to accelerate Burden's pipe laying pace.

Get convincing proof of outstanding International Superior sideboom performance! Call your International Construction Equipment Distributor for a demonstration. And compare new bonus-powered International Superior TD-18, TD-14, and TD-9 sidebooms to any other similar-sized units. You'll discover why International Superior sidebooms give you that decisive extra margin of pipe-laying profit power for your equipment dollars.

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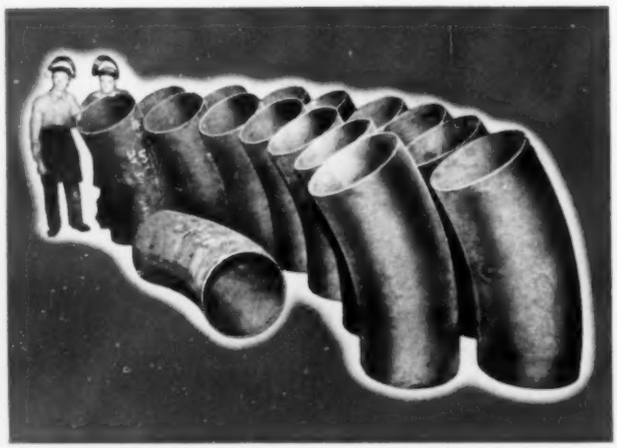
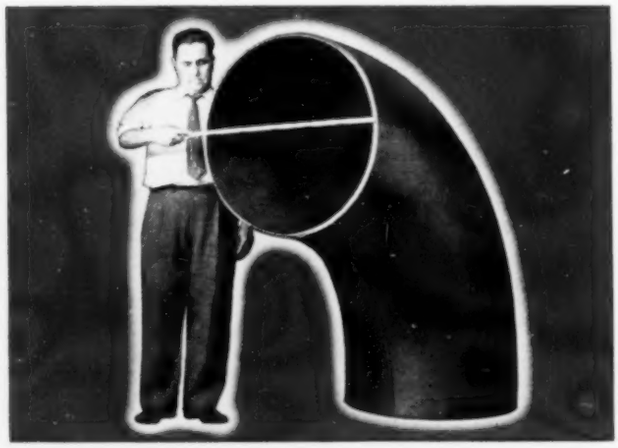
MIDWEST PIPELINE WELDING FITTINGS

SAVE TIME . . . CUT COSTS . . . SOLVE PROBLEMS



CONTOUR ELBOWS

Originated by Midwest and available in 22", 24", 26" and 30" sizes. Angles 10°, 15°, or 30° with 3D radius, providing a long sweep for easy pipe cleaning. 8" tangent at each end removes weld from highly stressed curved section and facilitates alignment. Uniform concentricity permits smaller angles to be obtained by cutting elbow. Available in various wall thicknesses of carbon steel, high yield and low alloy materials. Write for data sheet.

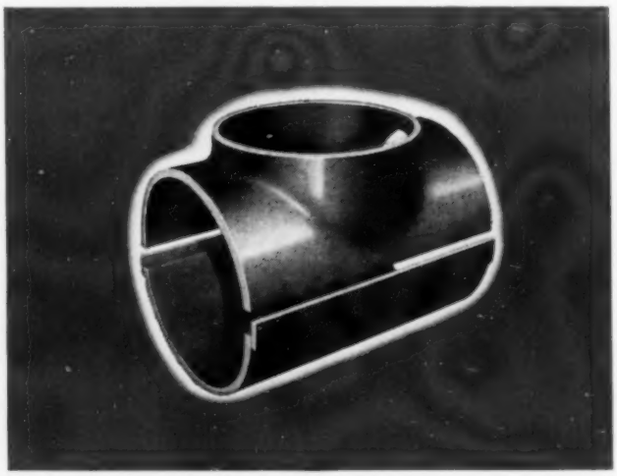


LONG TANGENT ELBOWS

Cost no more than ordinary elbows and are available up to 36" OD in wide variety of materials and wall thicknesses. Tangent at each end equal to ¼ nominal pipe size up to 24" OD—all larger sizes have 6" tangents. These added straight ends save pipe and often eliminate short nipple and extra weld; they remove circumferential welds from point of greatest stress . . . make lining up easier, save time and expense in welding. Write for Catalog 54.

REDUCING ELBOWS

Takes the place of straight elbow and reducer, thus saving one weld, requiring less space and reducing turbulence of flow. Stock sizes available up to 30" OD and in reductions to one-half of large diameter. Being fabricated from plate, it can be made in special thicknesses and materials. Write for data sheets.



WRAP-AROUND SADDLES

"Complete encirclement" type of welded branch reinforcement for making hot taps is available with or without welding strap and from carbon steel or high yield materials. In addition to fitting shown, other types illustrated in Section 8 of ASA B31.1 are available. Write for Data Sheet No. 20.

CAP SADDLES

Reinforcement for nozzle connection into cap. Available in sizes up to 24" on 36" in carbon steel and high yield materials.

Recognizing the fact that conventional welding fittings do not always best meet pipeline needs, Midwest some years ago began the development of special fittings. These are designed for a specific job . . . to save time, cut cost and improve pipelines. The unique Midwest method of manufacture makes the use of special materials easy, economical and permits better delivery . . . it also often enables us to improvise to exactly meet unusual conditions. Write us regarding your requirements.

MIDWEST PIPING COMPANY, INC.

Main Office: 1450 South Second St., St. Louis 4, Mo.

PLANTS: ST. LOUIS, CLIFTON, N. J. and LOS ANGELES

SALES OFFICES:

ASHEVILLE (BOX 446, SKYLAND, N.C.)
BOSTON 27—426 FIRST ST.
CHICAGO 3—79 WEST MONROE ST.
CLEVELAND 14—616 ST. CLAIR AVE.
HOUSTON 2—1213 CAPITOL AVE.
LOS ANGELES 33—520 ANDERSON ST.
MIAMI 34—2103 LE JEUNE RD.
NEW YORK 7—50 CHURCH ST.
ONEIDA, N.Y.—282 NORTH MAIN ST.
SAN FRANCISCO 11—420 MARKET ST.

STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

7676

ALL OPERATIONS ARE COMPLETELY INDEPENDENT—In addition to eliminating shifting time, *Independent-Travel* allows the operator to swing and hoist the load while travelling. Whether to save time or to jockey the boom around obstacles, the operator can swing the boom while his machine is travelling in either direction. This optional feature can be used with any front-end attachment.

Getting 9 hours' output in 8

Independent-Swing-and-Travel is available on 11 Link-Belt Speeder models. Eliminates shifting . . . saves 20-30 seconds each move

Link-Belt Speeder users are setting new high-production standards by equipping their machines with *Independent-Swing-and-Travel.* Why? It eliminates time losses ordinarily occurring when the operator shifts from swing to travel and from travel to swing. With *Independent-Travel* shifts are eliminated and the machine can swing and travel simultaneously . . . you can jockey the boom around obstacles in tight quarters, move away from bank cave-ins in split seconds!

If you'd like complete details, proof that *Independent-Travel* can up output . . . cut maintenance and spare parts costs, too — see your Link-Belt Speeder distributor or write Link-Belt Speeder Corporation, Cedar Rapids, Iowa.

MORE USABLE HORSEPOWER — Size for size, Link-Belt Speeder shovel-cranes utilize more of the engines' available horsepower. This bonus pays off in added power at the bucket teeth, greater line pull plus extra power to swing, hoist and travel. Although it gets more usable power and line pull out of the same engines used in other shovel-cranes, a Link-Belt Speeder remains well within the engine manufacturers' recommended operating speeds.

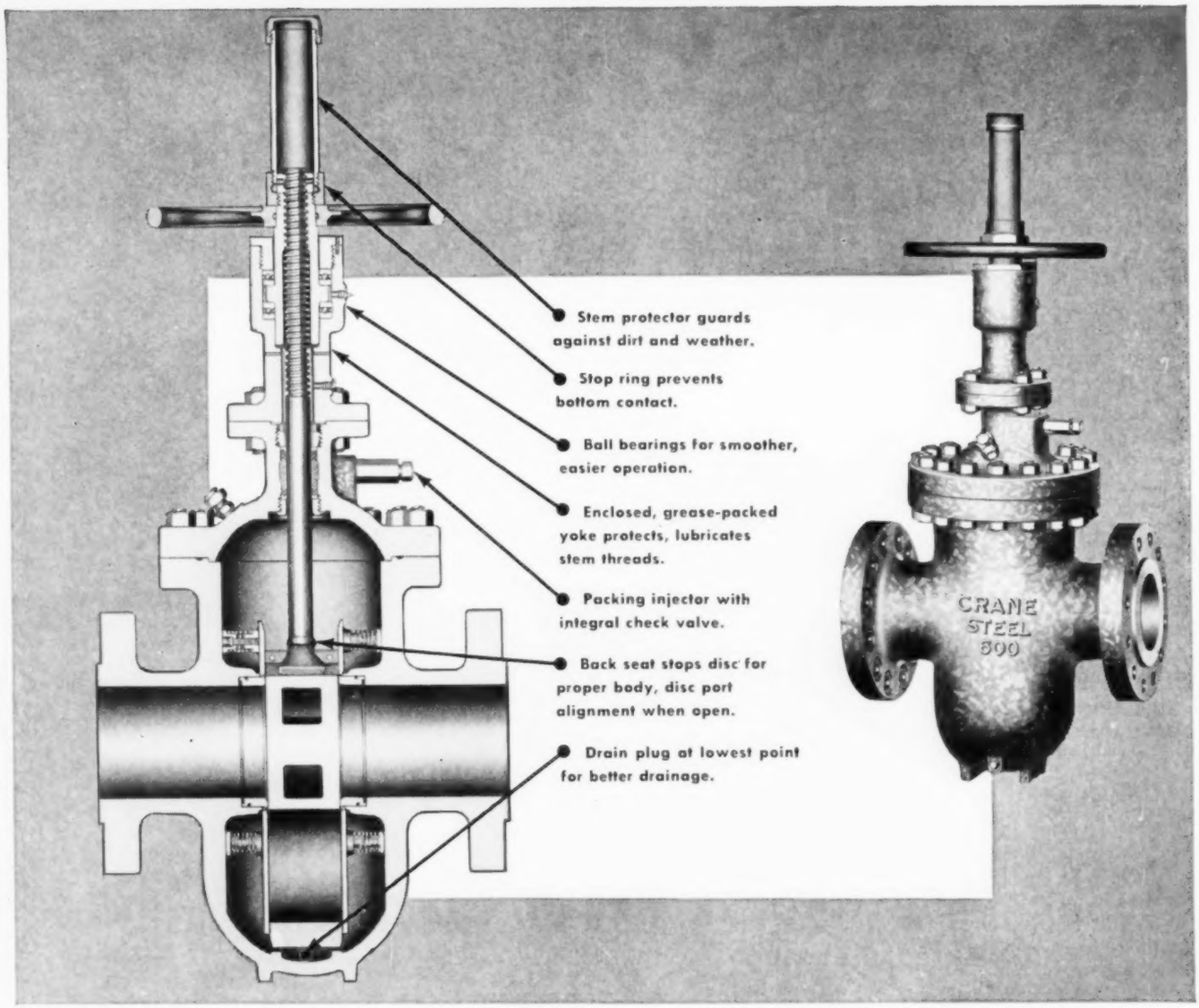
14.324 A

It's time to compare . . . with

LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls

For more data on advertised products, use Readers' Service Cards, last page.


Stem protector guards against dirt and weather.
Stop ring prevents bottom contact.
Ball bearings for smoother, easier operation.
Enclosed, grease-packed yoke protects, lubricates stem threads.
Packing injector with integral check valve.
Back seat stops disc for proper body, disc port alignment when open.
Drain plug at lowest point for better drainage.
CRANE
STEEL
800

New Crane conduit pipeline valve designed to save you trouble

Extensive field tests—under severest operating conditions—have already proved that this new Crane Pipeline Gate Valve can save you trouble on your pipeline services.

Its simple one-piece disc design—a Crane exclusive—gives this conduit-type valve non-directional flow—parallel seat faces provide tight seating at the outlet, eliminating need for excessive stem loading—line pressure does the work. There's no complex disc construction to cause sticking in operation. Self-aligning body seat rings can be slipped in and out by hand quickly and easily—more savings on maintenance.

Another feature you'll like is self-sealing seating. After closure, the upsteam pressure—acting on an area back of the seat ring which is greater than the area in contact with the disc—creates a differential pressure for absolutely tight seating. You'll also like the straight, smooth, turbulence-free conduit design . . . the spring-loaded disc plates that keep dirt out and grease in . . . the pressure-relieved body bonnet chamber . . . the trouble-free stuffing box with plastic packing . . . and the pressure-tight body bonnet joint.

You can order these new Crane Single-Disc Conduit Pipeline Gate Valves now in sizes 2 to 30 inch either straight-way or venturi type—both with spur or bevel gearing, if desired. For complete information, see your local Crane Representative, or write to address below.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

ELECTRIC-RESISTANCE-WELDED

LINE PIPE BY J&L

J&L line pipe made by the electric resistance welding process is a quality product. It is particularly desirable, economical and efficient because of uniform wall thickness, roundness, weldability, ductility, and availability in long lengths.

Uniform wall and roundness make for fast lining up.

Long lengths minimize field welds and cut construction costs.

Weldability is excellent, and the pipe bends readily to any desired course.

Offered in sizes 5-9/16″ through 12-3/4″ from the J&L mill at Aliquippa, Pa.

Ask any J&L Supply man for further details.

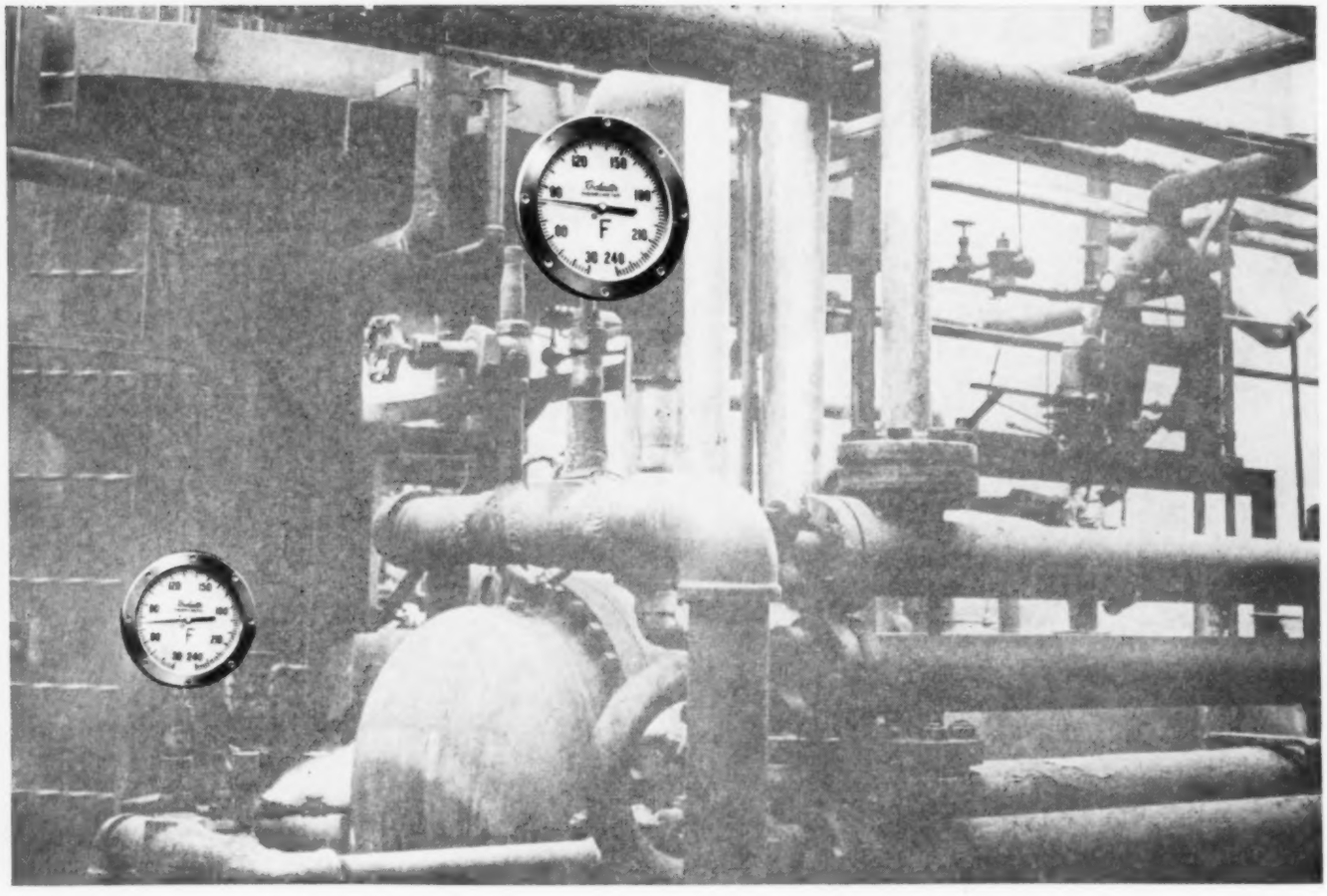
Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN STEEL

42

For more data on advertised products, use Readers' Service Cards, last page.



There's an RMC thermometer for almost every industrial requirement

Dial sizes from 1″ to 5″, stem lengths from 2½″ to 70″, scale ranges from −150° F to +1000° F. These figures represent *only* Rochester Manufacturing Company's *standard* thermometer specification limits. There is practically no limit to what RMC can do in the way of *special* thermometer applications.

Standard or special, *all* RMC thermometers are made of corrosive-resistant stainless steel, have hermetically sealed non-fogging dial chambers, are available with RMC's exclusive external recalibration device, and are guaranteed accurate to 1% of scale range. Why not remove temperature indication problems from your unsolved list—turn them over to RMC.

Look to RMC for Full-Line Instrumentation — for manufacturers and users of processing equipment—and many consumer products.

DIAL THERMOMETERS

PRESSURE SWITCHES

PRESSURE GAUGES

LIQUID LEVEL GAUGES

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Tell us your requirements for direct mounting and remote indicating instruments, and let RMC Engineering skill provide the answers!

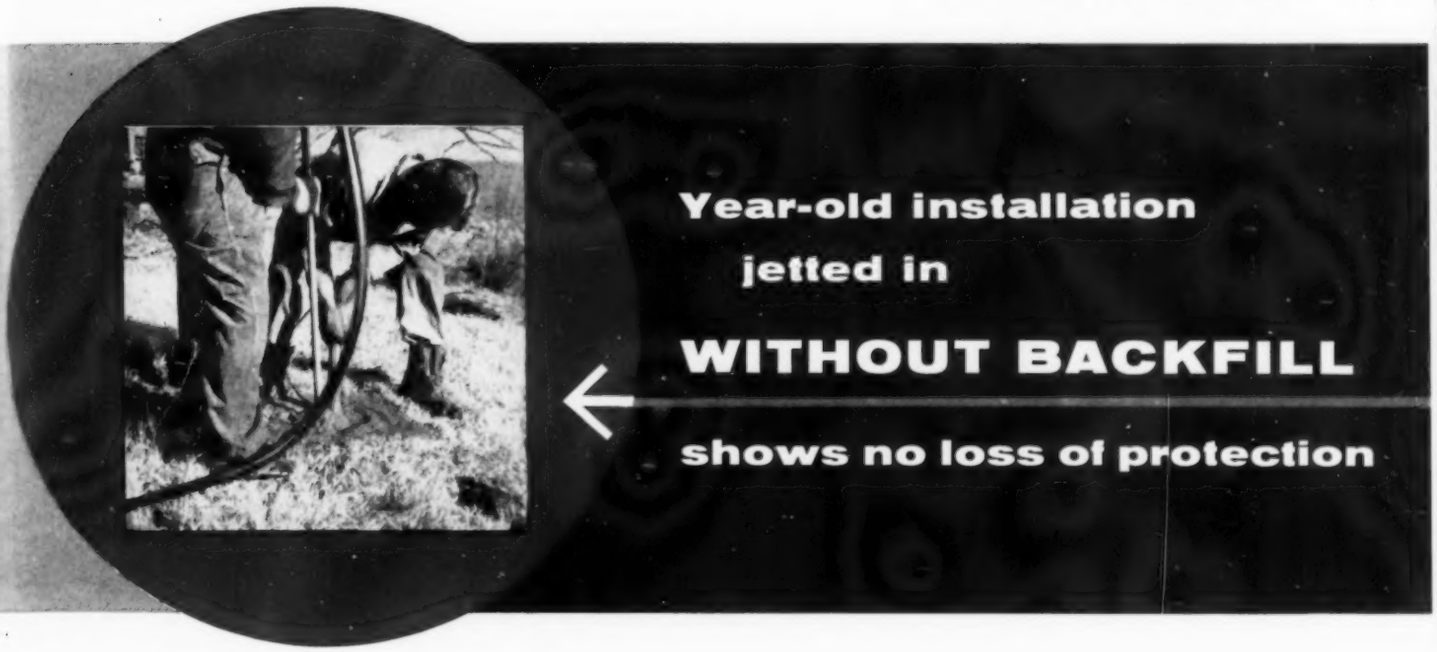
RMC

LIQUID LEVEL, TEMPERATURE and PRESSURE INSTRUMENTS

ROCHESTER MANUFACTURING CO., INC. • 207 Rockwood Street, Rochester 10, N. Y.

For superior protection of **underground** structures

DURIRON® ANODES



This actual installation graphically demonstrates Duriron's ease of installation and economy factors.

Twenty Duriron Anodes were installed to protect a pipe line in a creek bed area where sandy soil prevented backfilling. These anodes were jetted into place in the vertical position using a high velocity stream of water, and were placed with the top of the anodes 3 feet below the surface. *Each anode was in position within 60 seconds.*

The group of anodes produced an average of 33 amps at 36 volts with no tendency to gas block. Actually, the bed resistance has decreased since the original installation. There was considerable cost-saving in the elimination of carbonaceous backfill.

* Duriron anodes, bare or with backfill, resist all current densities common to ground bed applications.
* Duriron resists all soils. Care required only when operating at high current densities in high chloride areas.
* Duriron has dense structure. Will not absorb moisture or gases causing breakdown. High weight factor gives longer life per anode size.
* Duriron has good electrical conductivity. Minimizes heavy current discharge near connection for uniform consumption.
* Duriron is mechanically strong. Metal-to-metal contact avoids loss of protection due to poor connection.

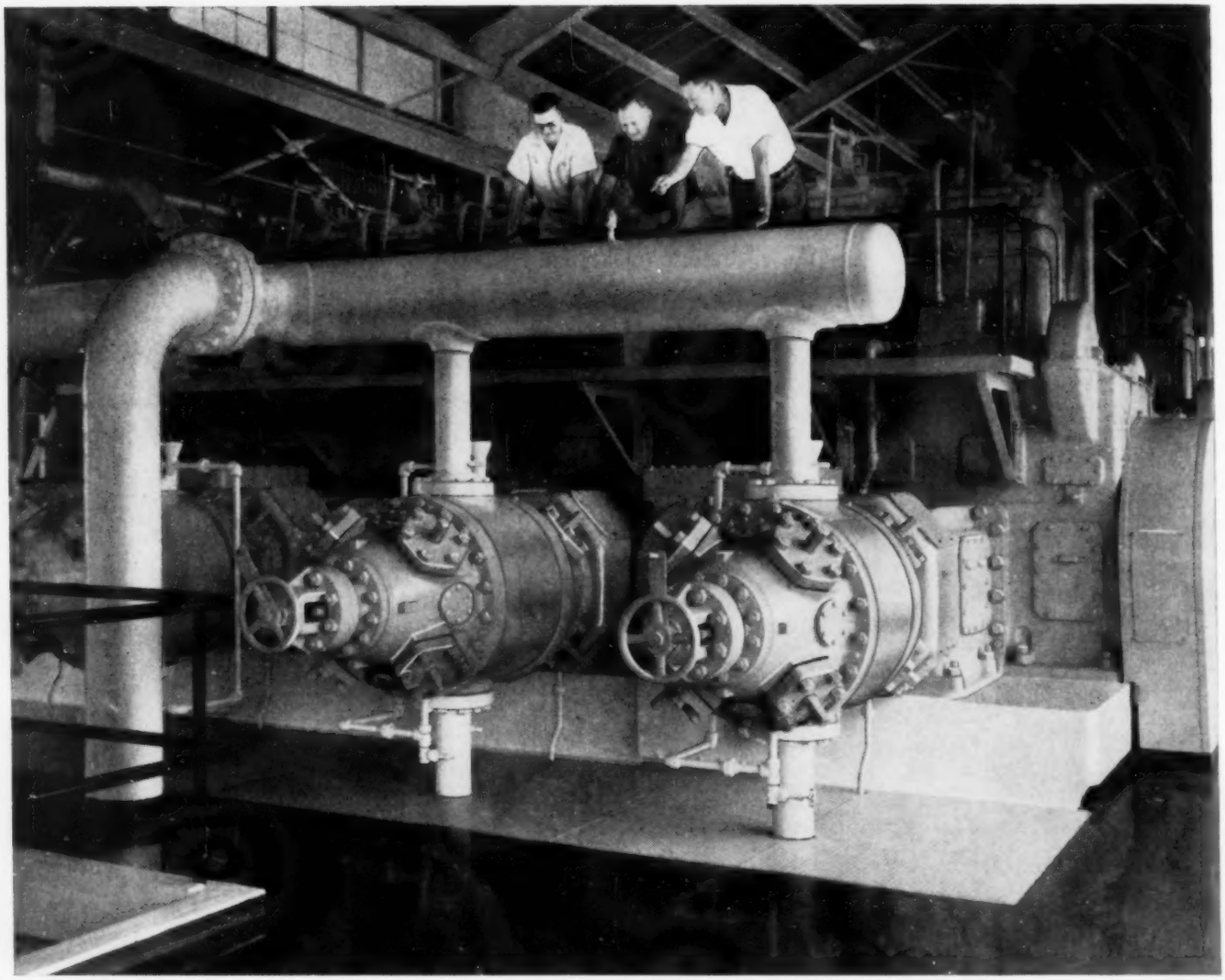
THE DURIRON COMPANY, INC.
DAYTON, OHIO

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

SEE BULLETIN DA/2

For superior protection of **underground** structures

DURIRON® ANODES



Richard N. Rogers, Results Engineer (left), W. C. Drienhofer, Station Superintendent, and R. A. Cuyler, Jr., Gulf Sales Engineer, inspect one of the 31 units lubricated by Gulf Security since 1944.

At Tennessee Gas Transmission Company's Middleton Station . . .

Not a ring change in 26,800 hours with

GULF SECURITY OIL

31 gas engine compressor units have been running smoothly at the Middleton Station with Gulf Security Oil since 1944. The records show 26,800 hours operation without a single ring change. And after 85,000 hours, Security in the crankcase was still in excellent condition.

Here for 13 years Gulf Security has lived up to its name—security against operating troubles and high maintenance costs. Gas engine compressor units lubricated with Gulf Security are consistently free of heavy port and ring belt deposits. Wear is negligible—in fact, ring and liner life in both power and compressor cylinders is well above average. Bearings last longer, too.

When you use a Gulf product you get an extra dividend—the free services of an experienced Gulf engineer. He's always "on call" to assist you with any problem involving lubricants, fuels, or any other petroleum product. Write, wire or phone your nearest Gulf office.

GULF®

GULF OIL CORPORATION

1822 Gulf Building
Pittsburgh 30, Pa.

Sun Pipe Line Company's new 110-mile line of NATIONAL SEAMLESS doubles delivery capacity to vital Newark-New York area.

10,951 tons of 14" National Seamless Pipe — varying in wall thickness from ¼" to ½" —now enables Sun Pipe Line Company to double its delivery to its Newark plant. The new pipeline also saves time, because it largely eliminates the need for water transportation from Twin Oaks, Pa., into crowded New York Harbor.

Requiring only one pump station, at Twin Oaks, better than 83,000 barrels of gasoline or 65,000 barrels of fuel oil can be handled every day. The new 14" pipeline replaces Sun Pipe Line Company's old line . . . also constructed of National Tube pipe. It crosses three major rivers, the Schuylkill, Delaware and Raritan. These underwater portions of the line utilize the ½" wall sections, where extra stress and strain are exerted. But withstanding extra-rough conditions is "old hat" to National Seamless Pipe . . . its reputation for accomplishing difficult tasks is well established.

National Seamless Line Pipe combines the characteristics of high strength, extreme flexibility, and uniformity, with superior welding properties, to assure the user of many years of satisfactory service.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO,
PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

In Pipelines Too . . . Seamless Does It Better

NATIONAL SEAMLESS PIPE AND TUBES

USS

UNITED STATES STEEL

If it's BLUE-dyed Asbestos

YOU CAN BE SURE IT'S FLEXITALLIC

In every asbestos-filled Flexitallic Gasket, the blue dye in the Canadian asbestos filler provides positive product identification. When you see Flexitallic Blue, you can be sure it's a genuine Flexitallic Spiral-Wound Gasket . . .

- the original spiral-wound gasket made exclusively by this Company since 1912.
- constructed to meet specific conditions of thermal and mechanical shock, vibration, weaving and other joint stresses.
- flexible and resilient, self-adjusting to changes in operating conditions—affording greater safety, dependability, and long service life.

In every field of high-pressure seal, look for Flexitallic Blue. It's for your protection.

FLEXITALLIC GASKET CO.
8th & Bailey Sts., Camden 2, N. J.
Representatives in principal cities

Flexitallic®
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

* Flexitallic is a registered trade name. No one else can make a Flexitallic Gasket. Look for *Flexitallic Blue* — it's our exclusive blue-dyed Canadian asbestos filler.

HYDRANTS FOR PLANT PROTECTION

Types and sizes for every requirement

YOU'LL be ahead on many counts when you specify modern Darling Fire Hydrants. Just for example . . .

Your system can include hydrant types exactly right for special or unusual service needs — breakable coupling types where traffic damage is common, concealed flush types for airport and pavement installation, Tee-base types to eliminate lateral connections where practicable. These and a few of the other types are shown here.

Equally important, Darling's unique B-50-B development (now available in all except the Tropical type) introduces *ball-bearing* operation combined with "O" ring seals. Result: a packless, dry-top hydrant. No packing gland maintenance. Operating threads and bearings *stay* lubricated and water can't reach them. Operation is far easier, far faster . . . and you avoid lots of maintenance time and trouble.

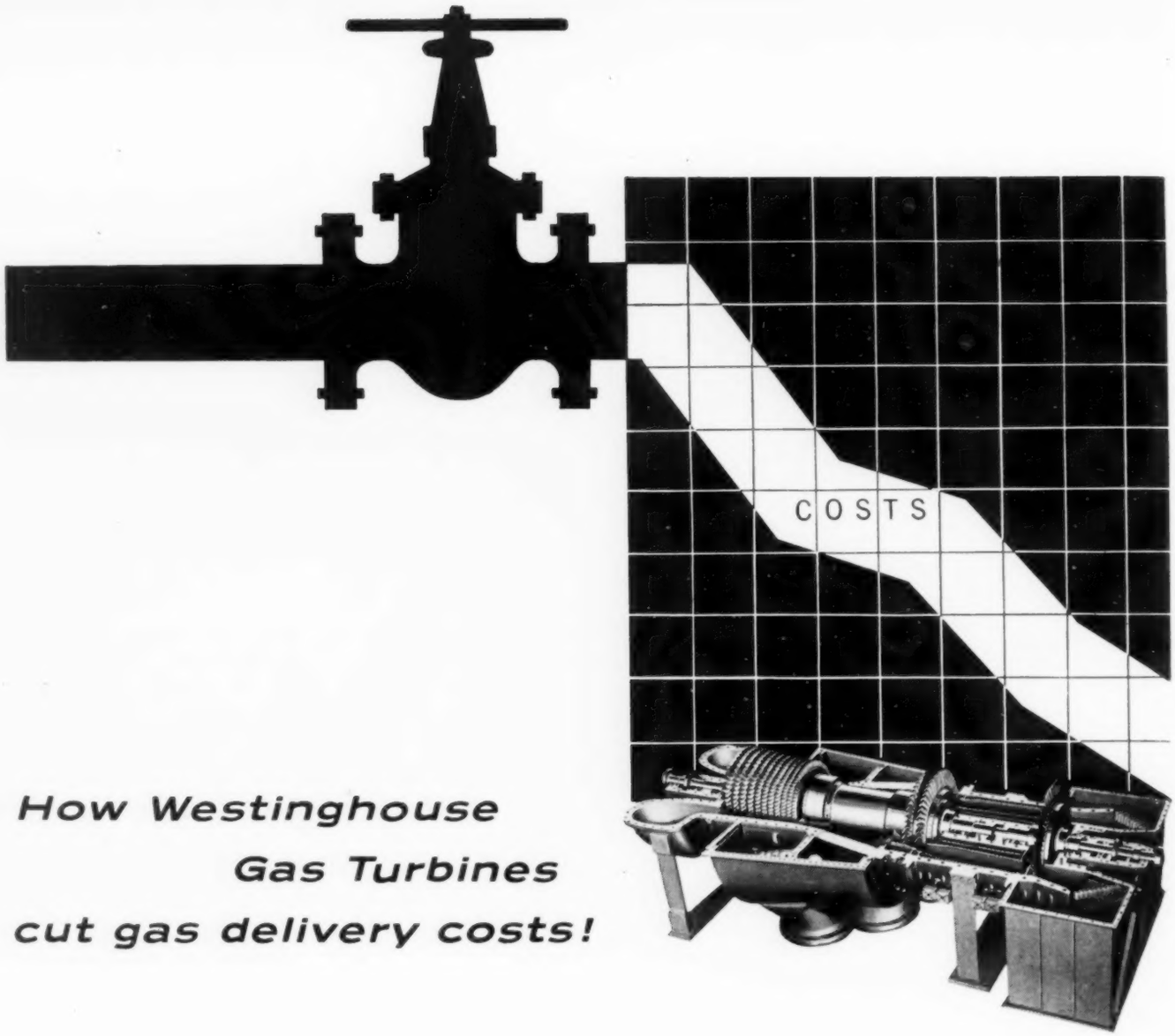
Send for complete information. Better still, ask to have a Darling engineer check your needs and tell you just what you stand to gain with Darling Hydrants.

TRADE DARLING MARK

DARLING VALVE & MANUFACTURING CO.

Williamsport 27, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.



How Westinghouse Gas Turbines cut gas delivery costs!

EACH MONTH, MORE WESTINGHOUSE gas turbines are being installed for gas transmission. These orders indicate it's time to take another look at the savings offered by the modern Westinghouse gas turbine for pipeline pumping! Here's what you get:

Extra hp during cold weather—Up to 25% more horsepower . . . when you need it most!

Lower initial cost—based on unit horsepower, not considering the extra 25% during cold weather. And, usually, no reduction gear is needed.

Lower station structure cost—The gas turbine weight is less than 45 pounds per hp and the vibration level is low.

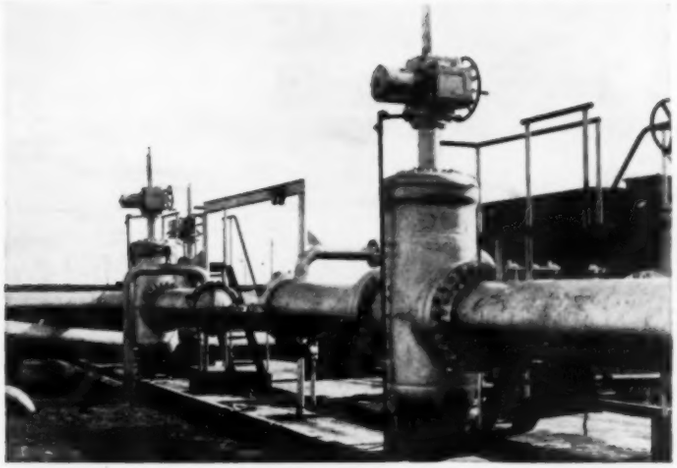
Simple maintenance—Lifting the cover exposes the entire gas turbine for inspection . . . a feature pioneered by Westinghouse.

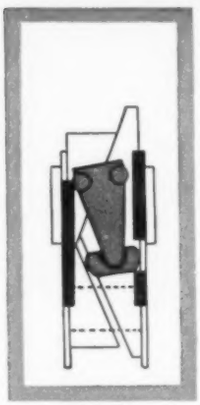
Low operating costs—Minimum man power and low lube oil consumption are just two of the many operating cost advantages.

No cooling water needed — Eliminate water-handling problems and risk of water supply failure.

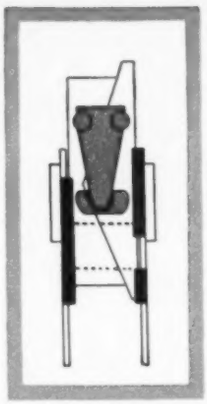
Challenge us to prove that the modern Westinghouse gas turbine can cut your gas transmission costs. Contact your Westinghouse representative or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-50601

YOU CAN BE **SURE**... IF IT'S **Westinghouse**

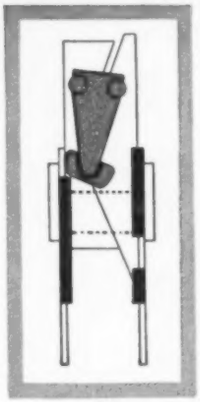




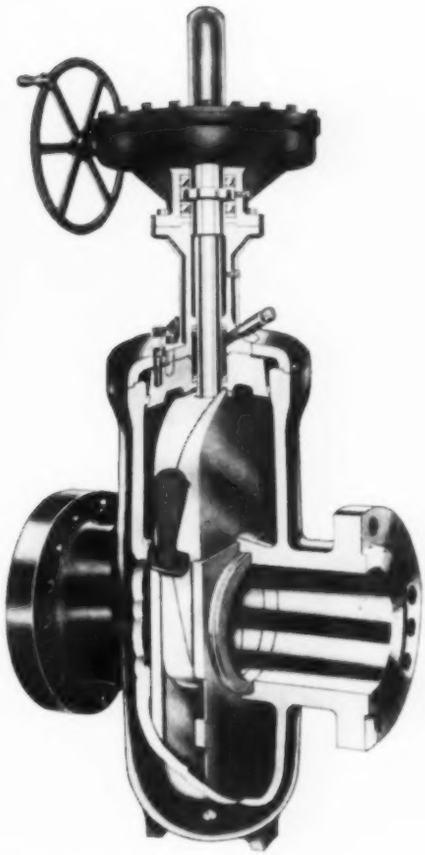
CLOSED POSITION



INTERMEDIATE POSITION



OPEN POSITION



You Get Free and Easy Opening and Closing in

W-K-M LEVERLOCK* GATE VALVES

You never have trouble opening or closing, even the largest W-K-M® Pipeline Valve, against any pressure, in any service condition.

The exclusive centralizing mechanism found only in Leverlock Valves is the answer. This positive-acting mechanical device holds the gate and segment in a collapsed position so there is no tendency to wedge while valve is being opened or closed.

W-K-M Gate Valves give you longer service with less maintenance. They are your best valve investment for all pipeline services—in sizes 2" through 34" (Sizes 6" and larger are Leverlock Valves), ASA 300 lbs. to ASA 900 lbs. Sizes 2" through 12" are available through supply stores.

*TRADEMARK OF acf INDUSTRIES, INCORPORATED.

Other features that make W-K-M Valves leaders in pipeline service—

• Parallel Expanding Gate provides controlled force seating — upstream, downstream. • Through-Conduit assures full volume, free flow with no turbulence — no pressure drop — free passage of scrapers. • Renewable Seats — may be installed while the valve is in the line. • Pressure seal bonnet, seals tighter as pressure increases. • Superfinished stems — Enclosed packing box — seat lubrication.

W-K-M

DIVISION OF acf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

Write Dept J-8 for your copy of the new W-K-M ASA Through-Conduit Gate Valve Catalog 300.

MANUFACTURERS OF W-K-M GATE VALVES · acf LUBRICATED PLUG VALVES · KEY-KAST ALLOY STEEL PIPING FITTINGS · KEY RETURN BENDS AND FITTINGS

9714

Wheaton T-1550
Water Drain Valve

TIGHT SEALING!

Get Wheaton *precision* in DRAIN VALVES

Wheaton, producer of quality water-drain-off valves for many decades, has added to its line the new "T" series of water drain valves.

These new valves have bodies of steel for strength and fire protection. They incorporate a stainless steel seat that is non-corrosive and long lasting. A composition disc in poppet assures a tight, leak-proof valve that drains dry.

Let Wheaton *precision* in drain valves increase the efficiency of your storage tanks. Wheaton's 65 years' experience is your assurance of *dependability*. Send for Catalog No. 66, which illustrates and describes the complete line of Wheaton Tank Fittings.

WHEATON BRASS WORKS, UNION, N. J.

Manufacturers of Loading Arm Assemblies, Swing Joints, Loading Valves, Tank Fittings and Truck Tank Equipment

EMCO LIMITED, LONDON, CANADA

EMCO BRASS MFG. CO., LIMITED, WESTWOOD, MARGATE, KENT, ENGLAND

Manufacturing licensees in Germany, Sweden, France, Brazil, Australia

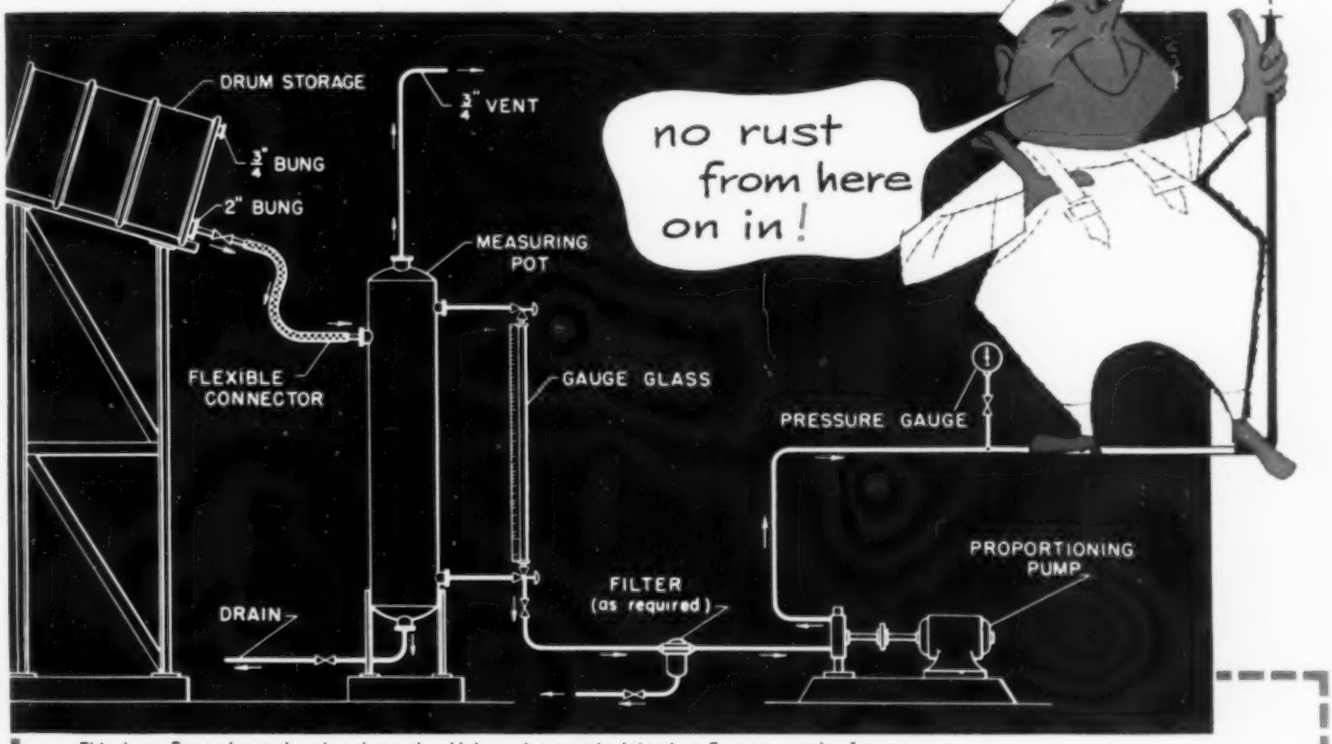
Tank Fittings by Wheaton

the best by every standard

If it's a question of corrosion...

UNICOR®

...is the answer



This is a flow chart showing how the Unicor Automatic Injection System works for you.

Question: *How can we eliminate serious filter fouling in blending tank caused by formation of highly peptized iron rust during processing?*

Answer: UOP's Unicor corrosion inhibitor solved this problem for a large southern refiner not long ago. Before Unicor application, a yard-square panel of the tank interior was sandblasted down to bare metal to test Unicor's effectiveness. After several months of injection in the rundown line, this test panel was completely free of corrosion, the remainder of tank interior was free of filter-fouling rust.

Question: *Is addition of water necessary?*

Answer: No. Unicor is oil soluble. It also prevents rusting caused by unavoidably entrained or dissolved moisture.

Question: *Should Unicor be injected only in the rundown line?*

Answer: Unicor can be injected at any point in your process. The refiner mentioned above shifted the Unicor injection point from the rundown line to his crude fractionator overhead and in catalytic gasoline from the main column overhead receiver. This extended Unicor's protection to heat exchangers, condensers and towers between new injection points and blending tank. Unicor inhibits corrosion in all your processing equipment from the point of injection on . . . even to consumer equipment.

Question: *How much does Unicor cost?*

Answer: About $0.001 or a tenth of a cent per bbl. of product in normal application.

Let us send you samples of

UNICOR

for testing in your own laboratories.

UOP®

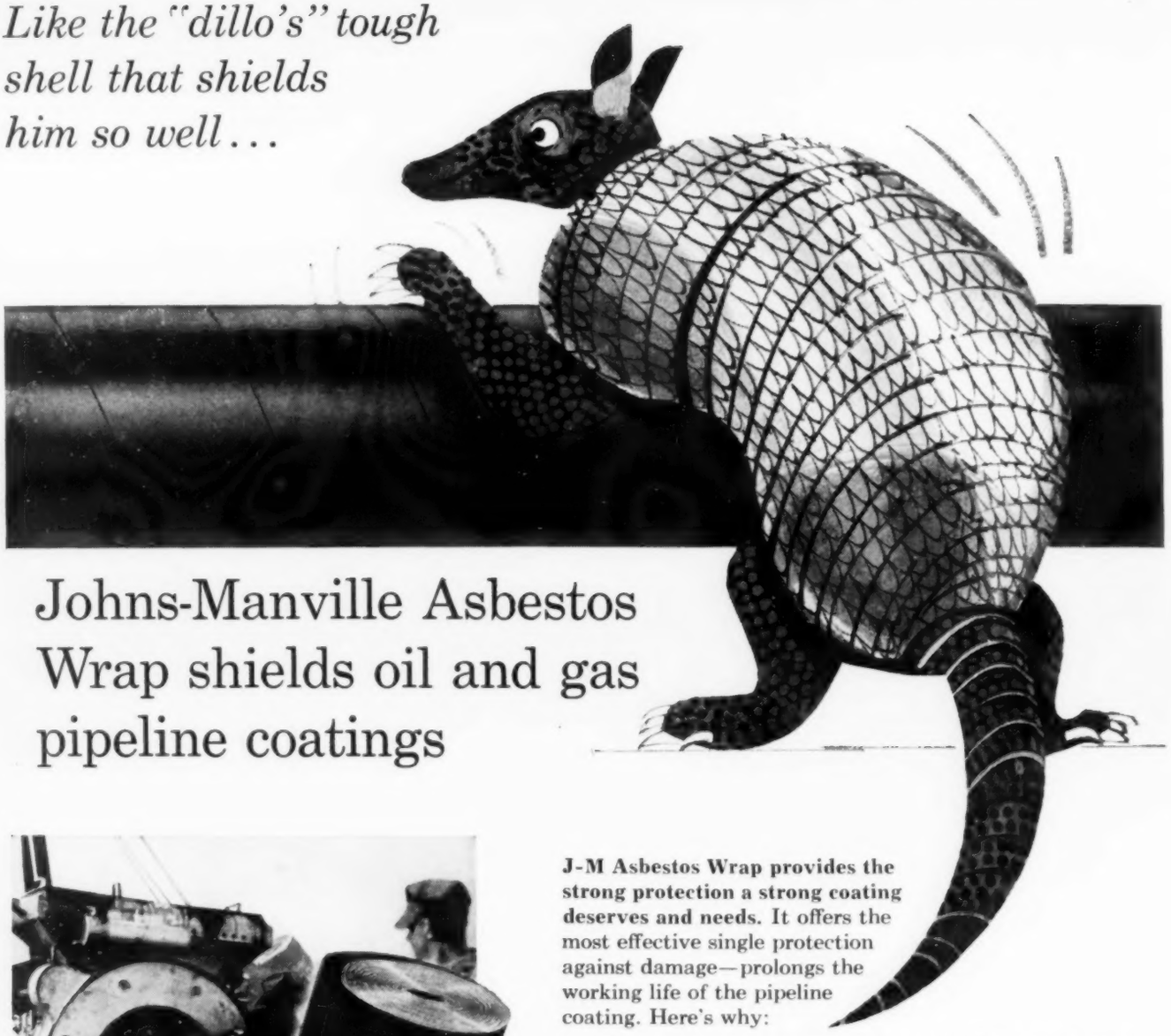
PRODUCTS DEPARTMENT

UNIVERSAL OIL PRODUCTS COMPANY

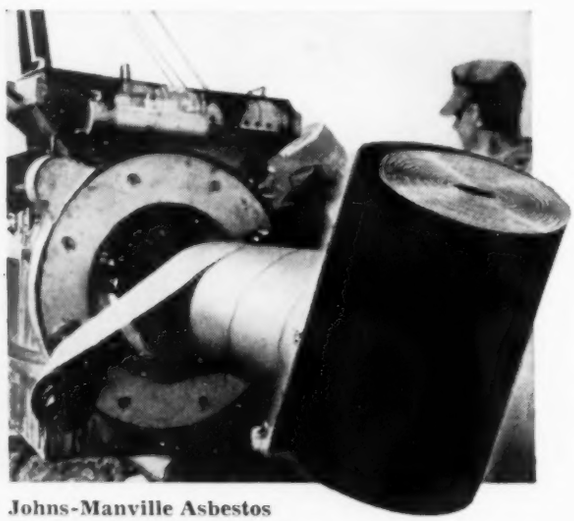
30 ALGONQUIN ROAD
DES PLAINES, ILLINOIS, U.S.A.

For more data on advertised products, use Readers' Service Cards, last page.

Like the "dillo's" tough shell that shields him so well...



Johns-Manville Asbestos Wrap shields oil and gas pipeline coatings



Johns-Manville Asbestos Felt is available in 3 types for field application or mill wrapping:

#15 Asbestos Felt—the high-strength, uniform asbestos wrap that has given superior protection to pipe coatings for more than 30 years—under the most severe soil conditions.

#15 Transhield®—heavyweight asbestos felt with parallel glass reinforcement for high tear strength.

#8 Transhield—standard-weight asbestos felt with parallel glass reinforcement—for low-cost protection against average soil conditions.

J-M Asbestos Wrap provides the strong protection a strong coating deserves and needs. It offers the most effective single protection against damage—prolongs the working life of the pipeline coating. Here's why:

Asbestos is an ageless mineral . . . the fibres are strong and tough—cannot rot or decay. As used in J-M Wraps, the asbestos fibres are felted, then impregnated with a cold tar or asphalt saturant to form literally a flexible covering of stone. Like the "dillo's" tough shell that shields him so well—the enduring, "stonelike" J-M Asbestos Wrap shields pipeline enamels from earth loads, soil stress, and other forces that weaken coatings and permit corrosion of the pipeline.

Invite one of our engineers to show you the results of the three-year, extensive test program on "Pipe Line Coatings and Wrappers." Write to Johns-Manville, Pipe Division, 22 East 40th Street, New York 16, N. Y.

✓ STRONG PROTECTION • PROVEN PERFORMANCE
RESISTANCE TO SOIL STRESS AND DEFORMATION
HIGH-SPEED APPLICATION • LONG-TERM INVESTMENT
SIMPLIFIES CATHODIC PROTECTION SYSTEMS
REDUCES HAZARD • INCREASES SAFETY

Johns-Manville PRODUCTS FOR PIPELINE PROTECTION

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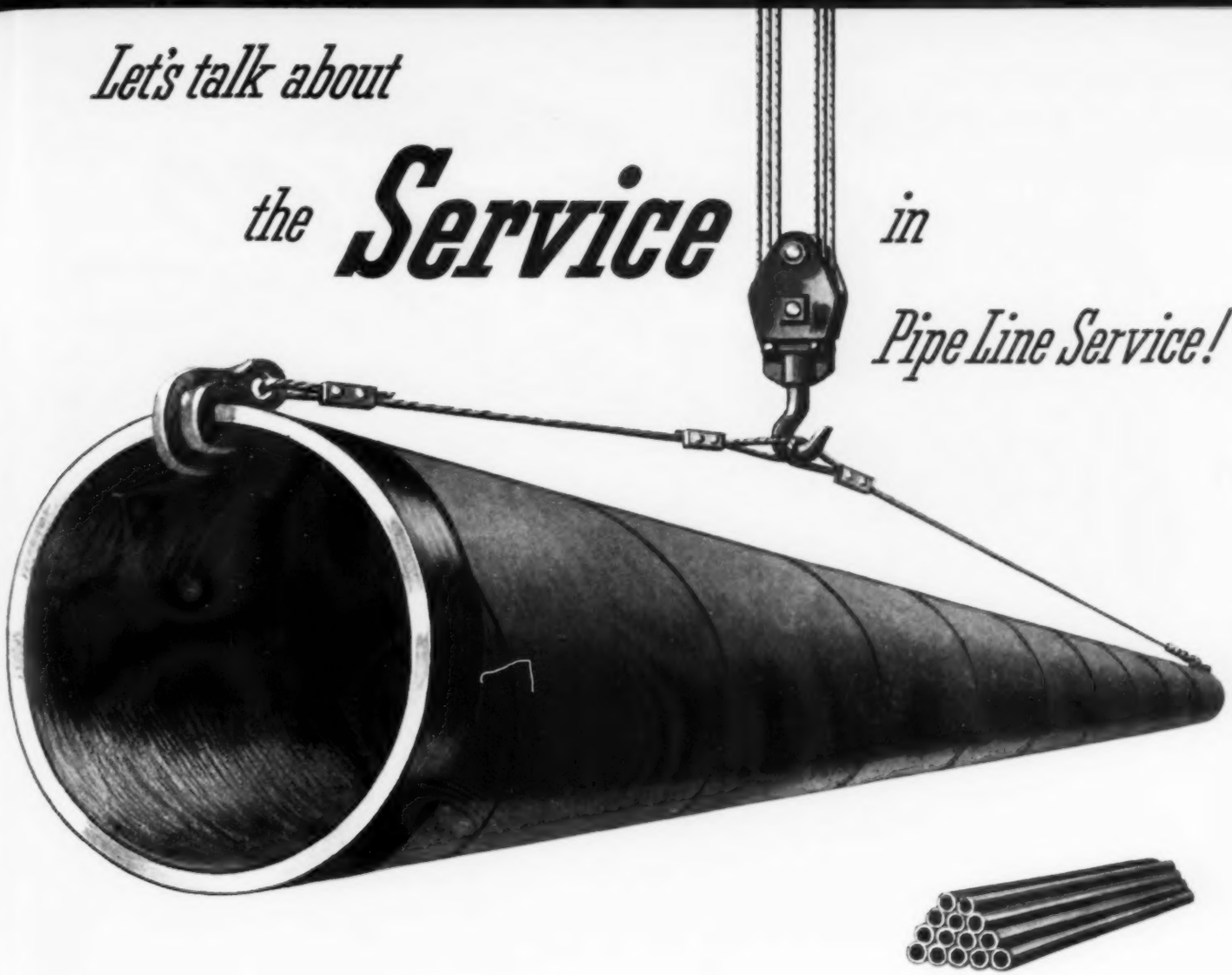

A company doesn't become a leader through quality of product alone. Although Pipe Line Service through the years has proved consistently that quality depends on coating and wrapping under controlled plant conditions, *service* is half the battle.

By service, we mean storing your pipe *at no cost to you* . . . plants strategically located near your sources of supply . . . and large storage facilities to allow you to purchase pipe when delivery is most favorable. Your pipe will be held in storage until needed—and then coated under the PLS high standards of uniformity. You *always* get a freshly applied coating job at the time pipe is ready to be laid. And PLS will ship your protected pipe *where* you want it . . . *when* you want it!

All this, *plus* the service of a PLS representative when needed. It's his job to help you in the proper handling, storage and laying of PLS protected pipe, to give you the maximum return on your investment.

This combination of quality *and* service assures you of the finest in pipe protection. On your next coating job call in your nearest PLS representative—you'll find that he can save you time, trouble and money.

There's a PLS plant strategically located to serve YOU!

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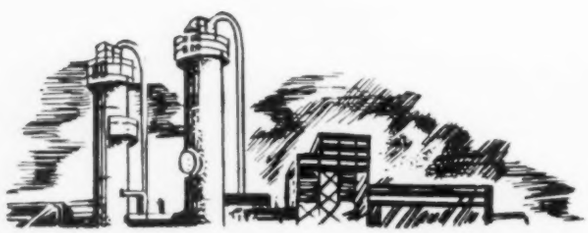
Quality pioneers in coating and wrapping pipe for a quarter century

Smithco pioneered the development of this rugged cooler for severe application. Its functional design, with *excess* cooling capacity, has met and overcome *every challenge* of extreme weather and operating conditions.

The "D" series cooler, latest in the growing tradition of fine Smithco Air Coolers, combines years of qualified engineering experience with the newest manufacturing methods to give you the most dependable unit in it's field.

Their reputation for dependability has attained for Smithco coolers industry wide usage and universal recognition.



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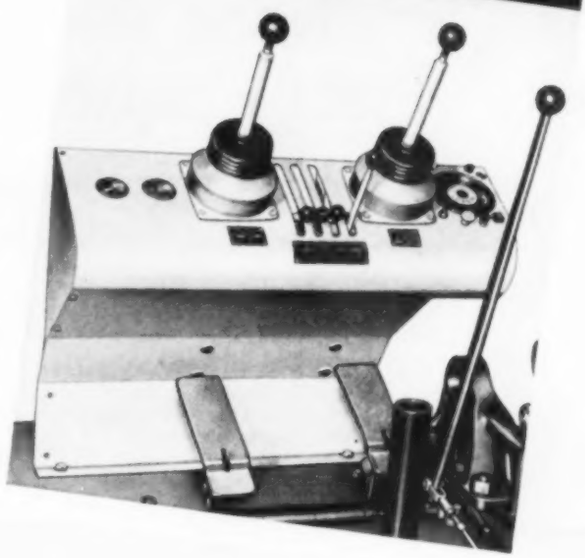

Ask your Thew-Lorain Distributor for all the new ideas in the Lorain-26 Pipeliner . . . the 2-lever, "Joy-Stick" feature . . . the Torque Converter that automatically matches power to digging demands . . . a heavy-duty, sturdy crawler with enclosed, protected tread lock . . . hydraulic power operation of all crawler functions . . . sealed idler rollers on anti-friction bearings available . . . a longer, heavier Hoe Boom that digs harder materials — and digs deeper . . . these are a few. Be sure to get the Lorain-26 "Pipeliner" story.

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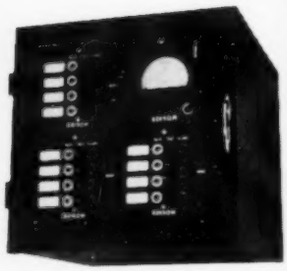
EDISON'S OMNIGUARD continuous temperature monitoring offers absolute dependability



Can be supplied for any type of annunciator or telemetry system

Edison has the answer to prohibitive pumping station and plant shutdown due to motor, generator or pump bearing failure. It's Edison's Omniguard, devised to detect and warn of excessive temperatures well in advance of danger points **with absolute dependability**. The use of Omniguard means the saving of thousands of dollars in downtime and maintenance man hours.

Here's how Omniguard works: easy-to-install resistance temperature detectors are inserted into the equipment to be monitored and are wired directly into the central control unit as one leg of a simple Wheatstone bridge circuit. No electronic circuits, moving parts, adjustments, or maintenance is involved in this fail safe instrument. As soon as a temperature rise occurs the mechanism is automatically shut off and an annunciator of any type (proximate or remote including telemetry) signals the warning.

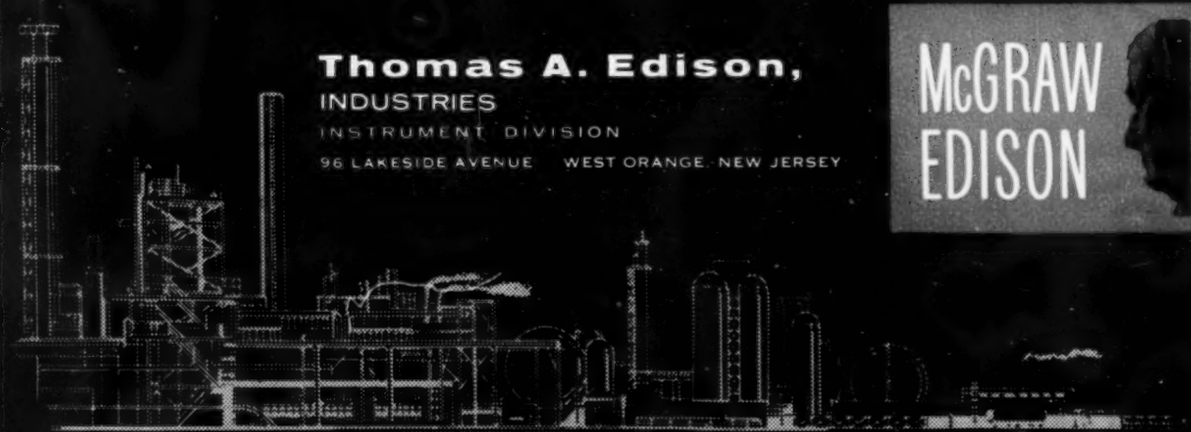
Omniguard can monitor from four to four hundred points with the simple addition of building block units; each point is independently circuited so that Omniguard continues to monitor if other points are shut down. Critical temperatures exist everywhere in the petroleum industry — from remotely unattended pipeline stations to catalytic "crackers," where processes are in motion, or where machinery is in operation. Learn how Omniguard can save you money initially — costs less than any other system available — and thereafter — eliminates downtime, maintenance and manual inspection of equipment.

Write and tell us about your particular temperature monitoring problem.

SPECIFICATIONS:

Voltage:	115 volts, 50 cycles
Power drain:	25 VA maximum
Voltage error:	±2°F. maximum from 100 to 130 volts
External alarm:	1 per monitor. Contact rating 150 watts or 3 amp. non-inductive load

Indicator requires no electrical connections. Power and resistance reading is carried through reeled cord when plugged into jack in face of monitor.



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McGRAW EDISON

PIPE LINE PANORAMA

California Line Sets New Record . . . Recent submarine pipe line project off El Segundo, Calif., marked up several "firsts." (See Page 37.) Anchor for "friction transposition" pull was located nine miles out at depth of 660 feet, for longest continuous pull ever made—in deepest water to date.

Project: Seven-mile string of 22-inch cement-coated sludge outfall line was successfully pulled and laid in 300 feet of water.

Underwater television camera and long two-tier launchway were instrumental in project's success. Camera gave engineers accurate and amazingly detailed picture of nose of pipe and pulling sled as line was being laid.

Are Gas Pipe Lines Common Carriers? . . . Texas Supreme Court has been urged in brief filed by five independent operators' associations to uphold Texas Railroad Commission order requiring ratable taking of natural gas. Commission declared Permian Basin Pipe Line Company a common purchaser and ordered it to take gas ratably from all producers in Puckett (Ellenburger) field, Pecos County, and give producers equal access to its processing plant.

The order was Commission's first on this subject. It was voided by lower court, upheld in an appeals court, and carried to highest state court. Suit challenges constitutionality of Texas Common Purchaser Act.

More Line Pipe on the Way . . . Besides having available mill space for cold-rolled welded big inch pipe (See July Panorama), manufacturers now report supply of thin-wall pipe is increasing. Reason: Small-diameter pipe sales are on the downswing.

Also, look for Canada's new $20 million automatic seamless tube mill at Sault Ste. Marie, Ontario, to help ease shortage. Plant will turn out 225,000 tons per year of oil well casing and refinery pipe, with some mechanical pipe. Most of the output will be used in Canada. However, it will relieve substantial tonnage of pipe previously imported from the U. S.

Oil Line Expansion Down in '56 . . . Chase Manhattan Bank reports total capital outlays for oil pipe line property, plant and equipment were down in '56 to $175 million, compared with $190 million in '55. This checks out with earlier report that new crude pipe line construction dropped to 2750 miles last year, vs. 4948 miles in '55.

However, outlook is for decided increase in construction during '57, beginning upward trend that will continue several years. Already in the mill are new crude and products projects totaling more than 7600 miles. Expected cost: $425 million—'57 expenditures alone will total $198 million.

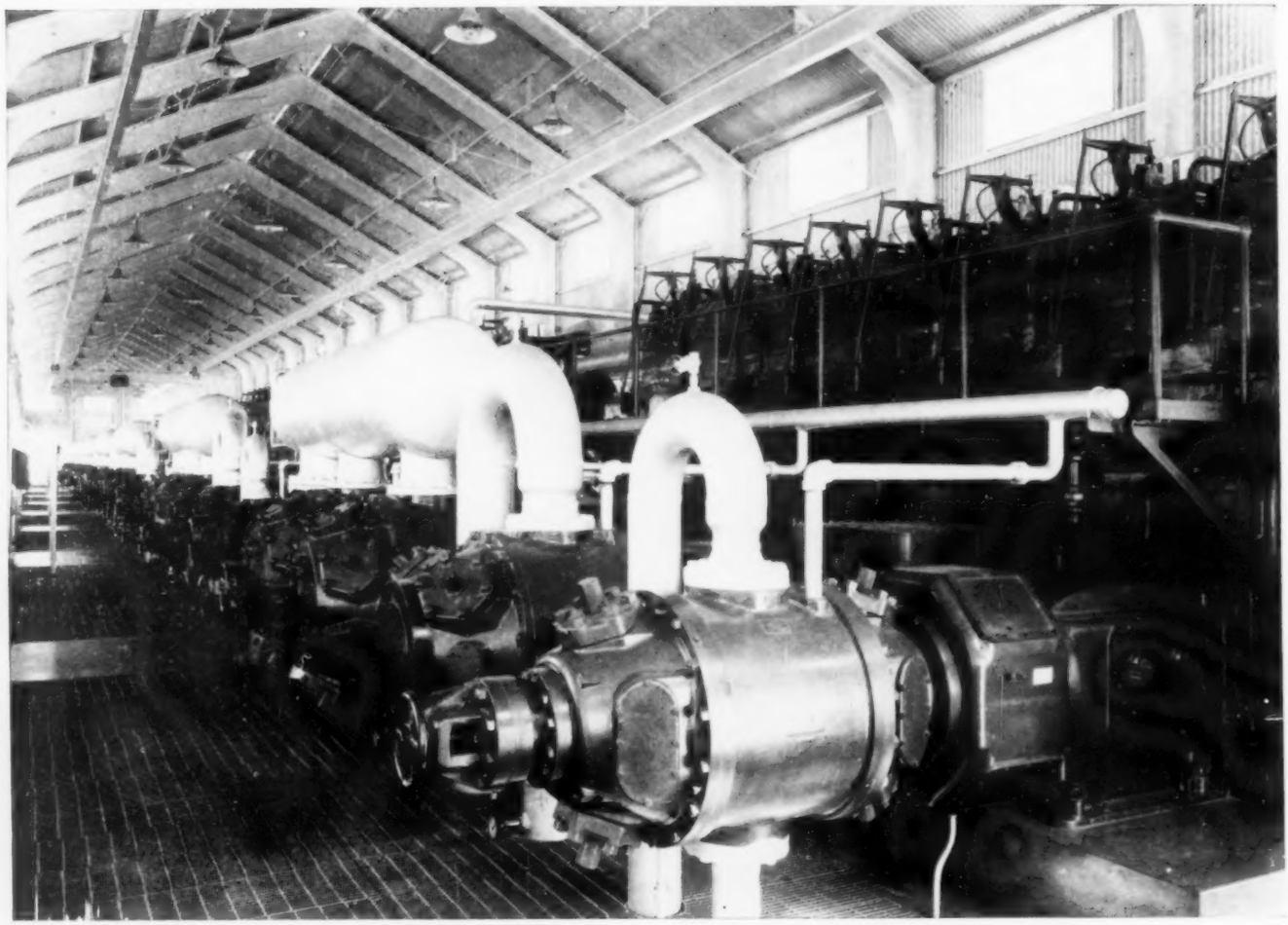
Gas Line Construction Continues Upward Swing . . . Expenditures for gas utility and pipe line construction will set new record in '57—$2.13 billion, a 37 percent jump over '56. Transmission projects will account for more than half of this year's total spending—$1.152 billion.

American Gas Association predicts nearly $4 billion will be spent on natural gas transmission facilities in '57-'60 period, compared with $2.35 billion spent during '53-'56.

El Paso-Pacific Northwest Merger Faces Test . . . Justice Department has filed suit to break up recent merger of El Paso Natural Gas and Pacific Northwest.

Charge: Merger "eliminates only major pipe line competitive with El Paso in purchase of natural gas from San Juan Basin and other sources, and only competition in sale of natural gas in several western states." Thus, according to the JD, merger violates anti-merger section of Clayton Antitrust Act.

Look to **COOK** for Better Rings!

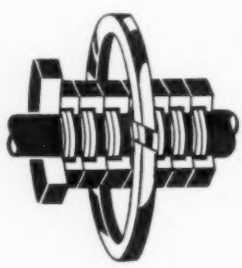


Cook packing and rings help keep compressors humming!

A well-known oil-producing company keeps this big lineup of Clark Bros. compressors running night and day in a West Texas gasoline plant. Keeps them running smoothly and efficiently, too — *thanks in good measure to C. Lee Cook packing and piston rings!*

Whatever type industrial equipment you operate, if it uses piston rings and packing, chances are good that it was Cook-equipped *when it was built.* That's why your best bet for continued trouble-free performance is to *keep it Cook-equipped.*

Your nearby C. Lee Cook representative will be glad to give you all the facts about precision-engineered Cook products. Why not talk with him soon? C. Lee Cook Company, 944 South 8th Street, Louisville 3, Kentucky.



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Seven-Mile Line Laid in 300 Feet of Water

In this operation off the California coast, the anchor for the "Friction-Transposition" pull was located nine miles out at a depth of 660 feet. Long two-tier launchway and underwater television camera used successfully in test of latest offshore methods.

By **GILBERT M. WILSON**
PIPE LINE INDUSTRY Staff

PLENTY OF UNUSUAL problems were involved in a recent submarine pipe line project off El Segundo, Calif.; in licking them, a joint venture team formed by three well known construction firms racked up several new records. A seven-mile string of cement-coated (inside and out) 22-inch pipe was successfully pulled out and laid in 300-foot water. It is the longest continuous pull ever made and in the deepest water, too. The project is a sludge outfall line for the City of Los Angeles; it was designed for a minimum life of 100 years in sea water.

Techniques used so successfully here may well have numerous applications in other offshore areas for oil and gas pipe line. A likely example is the construction of offshore tanker loading facilities. It should have numerous applications, as well, in other coastal communities faced with similar waste disposal problems, where installation of a steel line can eliminate the leakage and maintenance problems common to many old-type jointed concrete systems, and at a cost per foot per year materially below that of the jointed concrete pipe systems.

Most serious of the problems involved was the deep water. Although the end of the pipe line was anchored in 300 feet of water, the special pull cable anchor, set 11,000 feet beyond was in 660 feet of water. A narrow beach, between surf line and a high bluff, required that the pipe be made up into 60 strings, each 600 feet long. This made it necessary to devise a tieing-in technique that would function smoothly and with a minimum of lost time during the final pull. There were problems, too, in protecting the uncoated portion of pipe at field tie-in welds; in the simultaneous hydrostatic testing and releasing of the nose cone so the end of the pipe will be left open for operation; and in working in heavy seas and ground swells.

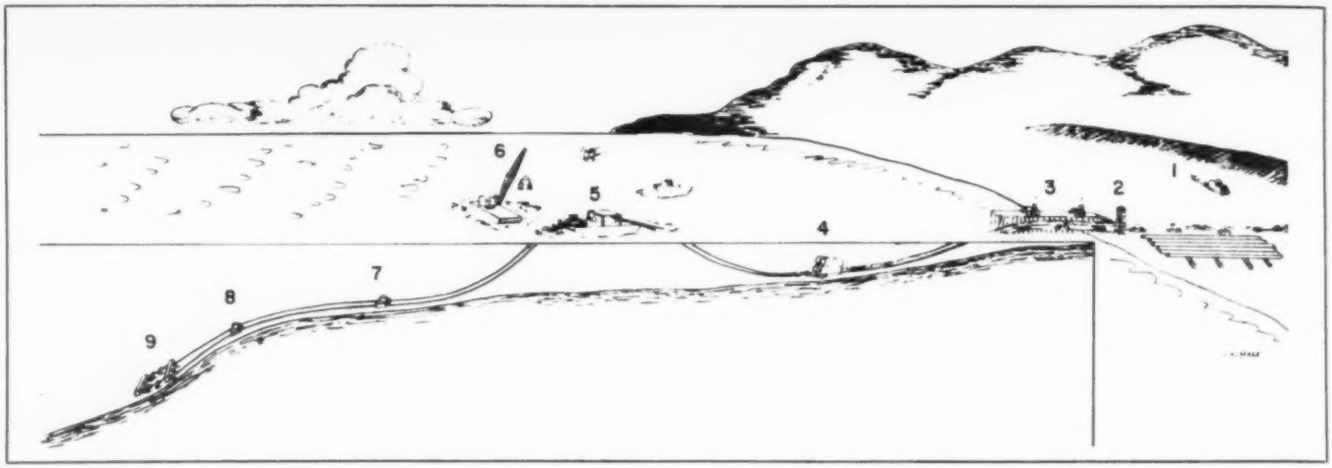
The joint venture team, titled Healy-Submarine-DeLong, was made up of three companies: Healy-Tibbitts Construction of San Francisco; Submarine Pipeline Construction Company, Inc., of Port Lavaca, Texas, and the DeLong Corporation of New York.

Personnel of Collins Construction Company, with specialized equipment and procedures under license to Submarine Pipeline Construction handled make-up and installation of the pipe line. Design of the line was furnished by Hyperion Engineers, a joint venture of the firms of Daniel, Mann, Johnson & Mendenhall; Holmes & Narver, Inc., and Koebig & Koebig.

Pull Cable Anchored 9 Miles Out. The technique employed on the job, termed by Collins the "Friction Transposition Method," shifts dead load of an anchor to working energy. It involved the laying of a double pull cable, starting with 2-inch at the seaward end and tapering to smaller sizes toward shore. Cable stretched along the ocean floor between the heavy

More on this deep-water pull will be found on the following seven pages; text continued on Page 40.

1 The entire launching pier and surrounding work area can be seen in this aerial photo. In the background is the Hyperion treatment plant. In the foreground is the 1000-foot pier used to extend the launchway some 650 feet beyond the surf line. Seven miles of 22-inch pipe are made up in strings on the beach.



An artist's sketch (above) of the friction-transposition method used in laying seven miles of 22-inch pipe as a sewage outfall line for the City of Los Angeles at El Segundo, Calif. 1. Holdback winch attached to pipe with holdback sheave in place on end of string. 2. Control tower (75 feet high), nerve center for all launching operations. 3. 1,000-foot pier built offshore. Substructure used for launchway extensions, top tier for crane and sideboom tractors. 4. 60,000-pound pulling sled which held nose of pipe up during installation and was used as an anchor to the end of the pipe upon completion of construction. 5. Pulling barge with winch. Double pulling operations. 6. Derrick barge, used to transfer cable reels to and from the pulling barge during cable laying and during pulling operations. 7. and 8. Section anchor blocks used to separate the various lengths of double cable between the pulling barge and the anchor assembly. The blocks were stabilized with large pontoons. 9. 160,000-pound anchor in place on edge of Santa Monica Canyon, nine miles offshore. Water here is 660 feet deep. This large anchor was used to anchor the pulling barge as the pipe was being pulled to sea.

2 (Above) Due to the limited space along the beach available to the joint venture as a work area, pipe was made up in individual strings, each 600 feet long. As the pipe came from the concrete coating yard, it was stockpiled on the beach in the background.

3 Collins' general marine superintendent Jean E. Johnson, right, points out the giant holding area of one of the flukes on the 160,000-pound anchor assembly. It was later placed in 660 feet of water beyond the seaward end of the outfall line. The specially-designed anchor enabled the pulling barge to move the long string of pipe by the "friction transposition method."

4 A section anchor block is readied for lowering from the deck of the pulling barge. One anchor block was used to connect each section of cable laid between the anchor assembly and the pulling barge. The seaward end was fastened to the anchor located at a depth of 660 feet.

5 This aerial view of the pulling barge, a converted LSM, shows some of the deck equipment used in laying the cables for the pull. Here crew was in the process of lowering a section anchor block over the stern while working some 3½ miles offshore. More than 15 miles of cable was used during this intricate cable-laying operation.

anchor nine miles out and the launchway. During the pulling operations, the pulling barge, a converted LSM, positions itself over the right-of-way. A bridle of 2-inch cable, passed through the sheave on the pipe line pulling sled, is brought in through a bow opening and the two ends taken up on both drums of a huge, specially-designed double-drum pulling winch stationed amidships. The previously-laid pull cable system, anchored nine miles out, is taken in over the stern with two powerful, specially-designed spooling winches. During a pull, the full load is transferred directly to the pull cables through specially-designed roller bearing carpenter stops attached, through a block assembly and weight indicator, to the frame of the winch.

Thus anchored, the pulling barge winch pulls the pipe line toward it. At the end of a pull, the winch line is slacked off and the barge moved seaward, taking the pull cable in over the stern with the two powerful spooling winches. The same procedure is followed as the next and succeeding 1200-foot sections of the pipe line are pulled out.

Pipe Coated Both Inside and Out. Pipe used in the line is 22-inch O.D., ⅜-inch wall. The 40-foot joints were coated inside and out. Inside surfaces were given a ½-inch cement mortar lining. The outside surface, after cleaning, was primed and coated with a triple coat of enamel, then a fiber glass wrap and, finally, a wrap of enamel impregnated pipe line felt. For additional weight, the outside then was given a 1⅛-inch coat of concrete, the latter reinforced with a 12-gage, 2 by 4 galvanized wire mesh. Total weight of each joint, in air, is 8500 pounds. In water it has a negative buoyancy of four pounds per foot.

Two Level Pier Aids Launching. While preparations were underway laying pull cable and positioning the heavy anchor nine miles out, the pipe was welded up into 600-foot lengths and laid out on racks adjacent to the launchway. Shielded-arc welds, with maximum thickness of ⅛-inch per pass, were used to join the 30-degree bevelled pipe ends. Each weld was X-ray tested and the joint coated.

A two-level, 1000-foot pier was constructed to aid in the launching. The upper level, equipped with rails for a steam-powered crane, was used also by side-boom tractors. The lower level, an extension built alongside the main pier, was sloped downward into the water, providing a gradual downhill grade so the section could be eased

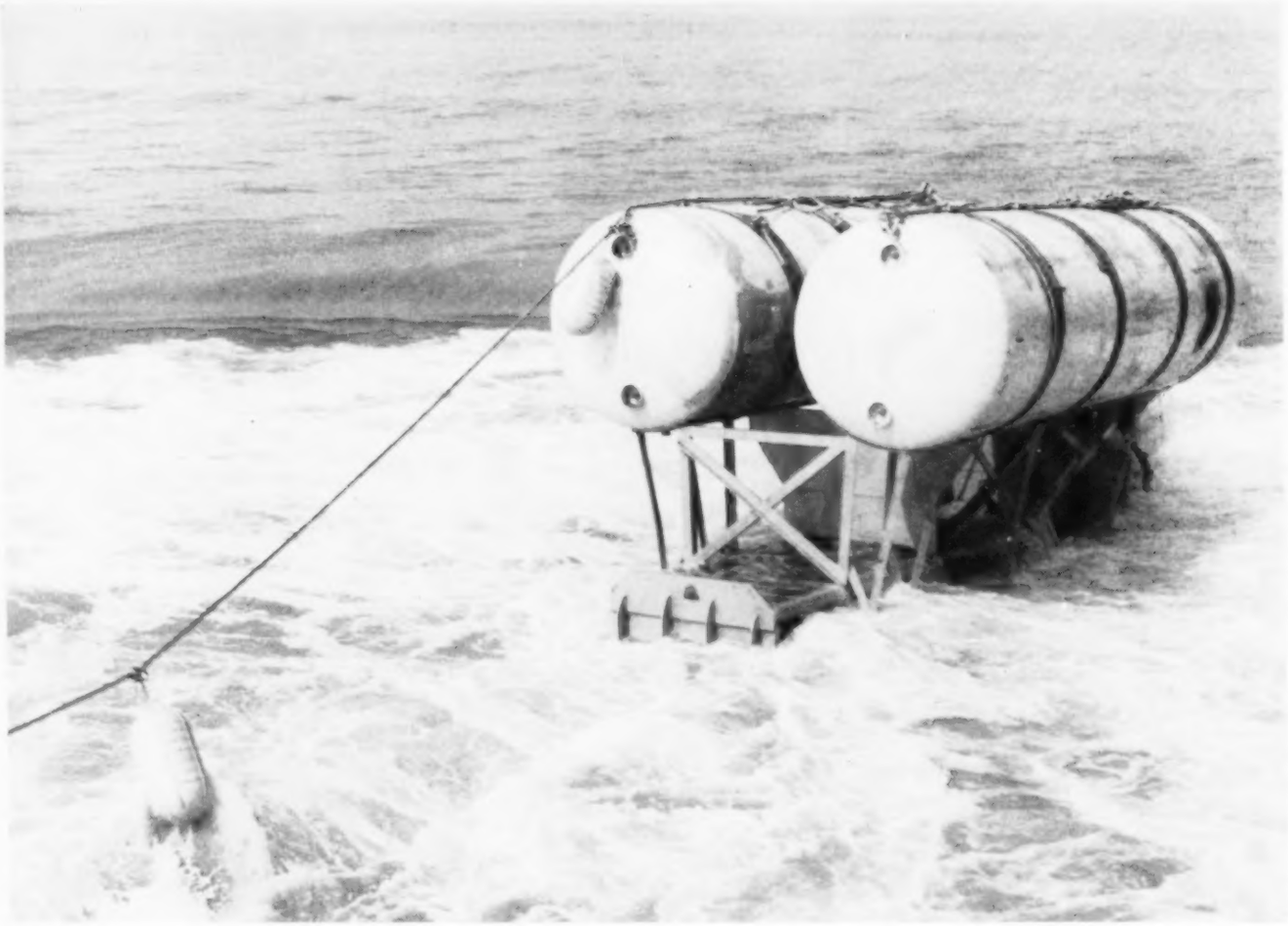
6 A helicoptor was used as a means of transportation between the pulling barge and shore. A trip by boat required approximately an hour, while the helicoptor made the distance in a matter of minutes. On deck, Thomas E. Broome, Submarine Pipeline's foreman, operates the mammoth winch during the pull. This air-operated winch is capable of pulling a load of 1 million pounds using a double line. Twenty-five hundred feet of two-inch cable can be spooled on each of its two drums.

into the water without stress to pipe or its coating. Rubber-tired launchway units were spaced at intervals along this lower level which, actually was a 1000-foot extension of the 600-foot launchway from the water's edge inland.

Hydraulic Jacks Speed Launchway Operations. The launchway system was so designed that a 600-foot string of pipe could be rolled over on to timbers which were hinged on the pipe rack end and supported by hydraulic jacks on the other end. The string could be stopped immediately above the rubber-tired launching units. With all jacks tied into a common hydraulic system, they could be lowered simultaneously, allowing the string to ease down on to the rubber-tired units. By moving this string out on to the launching pier to welding station No. 1, a second 600-foot string could be moved in behind it and welded to the first at welding station No. 2. A single pull, therefore, was 1200 feet of pipe.

Specially Designed Anchor. Preparing the heavy anchor, positioned nine miles out, and laying the pull cable between that point and shore, was a job that required precision and skill. The anchor system, actually two anchors in tandem, was conservatively designed to withstand a pull in excess of one million pounds. Designed for the type of bottom existing at that point, each of the anchors consisted of a 30-inch I-beam, 42 feet long, to which, at equally spaced intervals, were welded four heavily reinforced steel plate flukes, the latter five feet long and set at a carefully determined angle. The two anchors were bridled in tandem, 120 feet apart, by other steel beams. Four Danforth anchors, two on each side, were mounted between the two main anchors. Total weight of the anchor assembly was 160,000 pounds. Equipped with cable pennants and buoys for later retrieving, the anchor was placed in 660 feet of water 11,000 feet beyond the planned end of the pipe line.

Double Cable Laid on Bottom. A 2-inch cable bridle connected the anchor to a block and anchor buoy, the latter being the end block of the main cables that were strung between there and shore. Exclusive of the end block, there were nine such section anchor blocks, each being the link between pull cable sections laid along the ocean floor. The pontoon attached to the horizontal block holds and stabilizes the unit in that position dur-



7 This 60,000-pound pulling sled was attached to the nose of the pipe and pulled to a depth exceeding 300 feet. Each of the specially designed pontoons, above, has a lifting force of 20,000 pounds in sea water.

ing the pulling operations. The cable size in each of the sections was reduced gradually as it approached the shore. Starting at the anchor end with 2-inch, the size was reduced to 1¾-inch, to 1½-inch and, finally at the shore end, to 1¼-inch.

The cable-laying barge, starting from the anchor end, was moved and positioned by its own anchors. It was kept directly on course by transit, with tension being held on the cables with the 40,000-pound pulling capacity spooling winches, the latter stationed about midway between the main pulling winch and the stern.

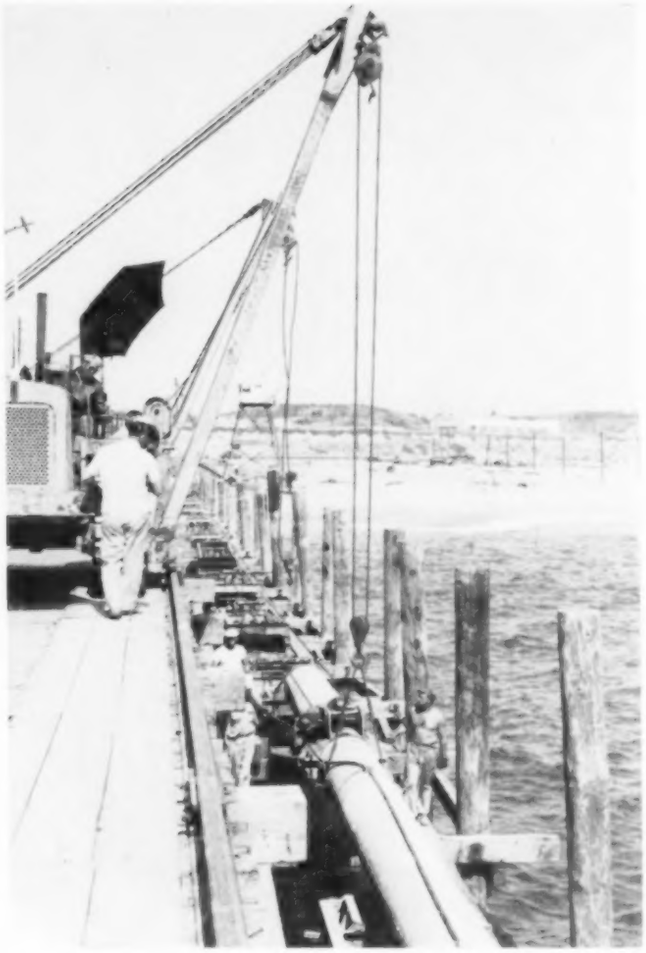
Heavy Pulling Sled. After the barge completed its cable-laying run toward shore, an 8500-foot section of 2-inch cable was spooled with one end on each drum of the large pulling winch and the loop was taken ashore and passed through a 5-foot diameter sheave attached to the massive concrete pulling sled forming the nose and anchor for the seaward end of the pipe line.

The sled, weighing 62,000 pounds in air, served the dual purpose of holding the nose of the pipe some three feet off bottom during pulling operations and, after the line was completed, becoming the end anchor. The pulling load was transmitted to the sled and, in turn, to the pipe, through compression in the concrete portion of the sled. To reduce the weight of the sled during pulling operations, two 20,000-pound lifting capacity pontoons were banded to the top of the sled. These left the nose assembly with a negative buoyancy of less than 1000 pounds. The pontoon releasing mechanism was attached to the steel bands binding the sled and pontoons together. When the nose of the pipe reached its final resting place, the releasing mechanism was tripped, releasing the pontoons.

Powerful Pulling Winch. The specially designed pulling winch, one of the most powerful of its kind in the world, was mounted approximately amidship on the cable-laying barge. It is a double-drum, air-operated unit powered by a 320-horsepower diesel engine. Equipped with torque converter and torquematic transmission, permitting shifting of gears under full load, the unit has three speeds and is capable of a single-line pull of 660,000 pounds at 25 feet per minute and, with a double line, 1,320,000 pounds. However, only a fraction of that capacity was required for this job. The unit has its own self-contained air compressor and light plant. A two-way radio built into the control panel affords instant communication between barge and shore. Each drum can spool 2500 feet of 2-inch cable.

Helicopter Speeds Pulling Operations. A small deck built over the winch provides a convenient helicopter landing space. The helicopter proved to be invaluable on this job in being able to shuttle personnel and materials between ship and shore during cable laying and, later, pulling operations. A shore-to-ship trip by boat required about an hour. By heli-

8 The final phase of the tie-in was complete as concrete was applied by the gunite crew. Inside of joint was protected by epoxy sleeve.



9 Sideboom tractors support pipe from pier as it moved down launchway. Holdback clump, connected to the running holdback, was attached to the end of the pipe.

copter it was a matter of only several minutes.

"Big Pull" Took 7 Days, 11½ Hours. The "big pull," once started, progressed smoothly and without serious incident. As the shoreward end of a section of pipe reached the end of the trestle it was tied off to a standing holdback. A 600-foot section then was pulled out along the launchway to welding position No. 1 near the end of the trestle and, while that weld was in progress, a second 600-foot section was moved up behind it to the No. 2 welding position, to make, when finished, a single 1200-foot section. Before the section was pulled out, however, a special holdback clamp was attached to the shore end. A restraining force of 20,000 pounds was held by a winch located on the beach. This steady tension prevented the pipe from running ahead of the pulling cable and helped maintain accurate alignment as the pulling progressed.

The pulling barge, working seaward along the pull-cable system previously laid, stationed itself before each pull by locking the pull cables in the special carpenter stops previously described, after which the powerful winch pulled the pipe line section toward it. As the barge moved seaward, and inasmuch as there were more than 15 miles of cable used in this cable-laying operation from anchor to shore, a number of spools had to be used for storing it. A feature of the special spooling devices was the provision for lifting off a full spool, laying it aside and installing an empty one with little interruption of work.

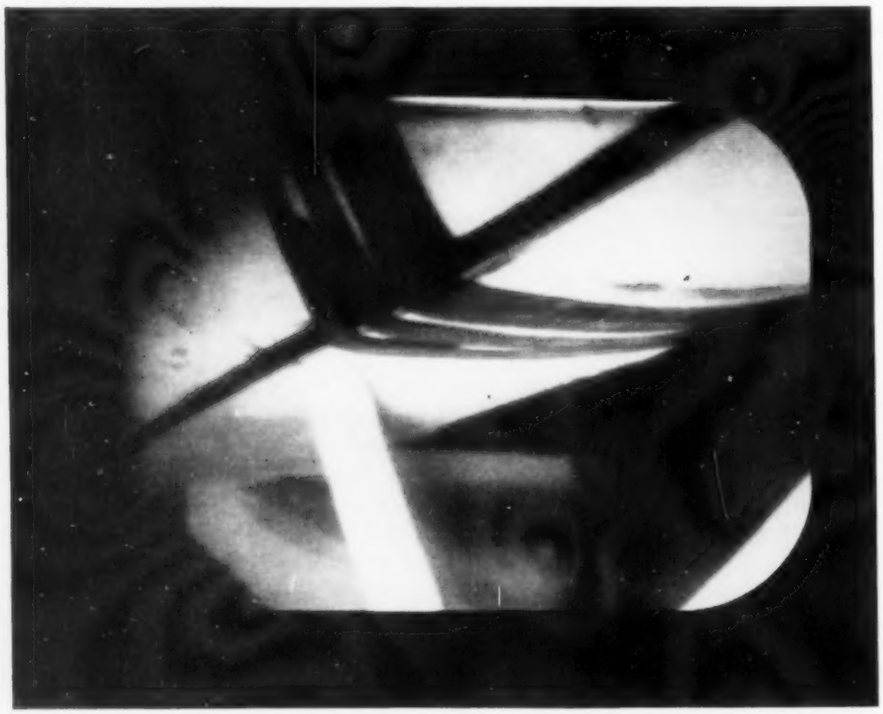
In this manner the entire 36,772 feet of pipe was installed and the pulling job completed in the remarkably short time of 7 days, 11½ hours.

Of inestimable value in the smooth operation was the complete communication system employed. Fifteen 2-way radios were in operation. These being located at such strategic points as the 75-foot control tower on the beach, from which all operations were directed; both welding stations; the pulling winch aboard the barge; the deck operations; the holdback winch; main office on shore; the X-ray trailer; crew boats; tug boats; and the derrick barge. A high degree of coordination was required considering the fact that each field weld had to be X-ray tested, results analyzed, the pipe coated and gunited, holdback system installed, plus the numerous barge details involved in handling pull cables, the main winch and the barge anchors.

Unusual Hydrostatic Testing Technique. Hydrostatic testing of the pipe line after the job was completed presented a unique problem. Inasmuch as the distant end of the pipe was in 300 feet of water, too deep for divers to work safely, the conventional method of capping the end of the pipe was ruled out. Instead, a plug method was developed which would allow testing to the prescribed 130 pounds per square inch and, after the test, leave the end open for operation.

Before launching, the pipe was

10 S. V. (Sammy) Collins checks the recording dynamometer used to measure holdback tension required to keep the nearly 7-mile string of pipe in alignment.



11 An underwater television camera gave officials of the project an accurate and surprisingly detailed picture of the nose of the pipe and pulling sled in 300 feet of water. In this photo, a portion of one of the 20,000-pound pontoons supporting the sled, the steel banding around the pontoon, and the pontoon saddle can be seen very clearly.

plugged by installing a tapered receptacle in the end. A tapered plug, sealed with an "O" ring, then was inserted into the receptacle. The plug, in turn, was held in place by a backup drum which was positioned and secured by a hook hinge at the top and a bolt at the bottom. An ejection pig then was placed in the end of the line and connected to the tapered plug.

The bolt securing the back drum was designed and calibrated to break at 150 pounds per square inch, only slightly greater than the test pressure. Upon completion of the hydrostatic test, line pressure was increased, the bolt yielded and the ejection pig, acting as a piston, forced the entire plug assembly off the end of the pipe and to the surface, leaving line open for operation.

Epoxy Sleeves Protect Inside Joints. Another problem, that of protecting the unlined portions of the pipe interior at field joints, was solved by the use of ½-inch thick pre-molded epoxy rings which were inserted before the joint was welded. This eliminated necessity for a man to crawl some 1200 feet through the pipe to apply a cement coat lining. Epoxy material was chosen because of its resistance to the heat created by welding.

Upon completion of the pull, the remaining section still on the launchway was raised and secured in place while the launchway units and supports were removed. The line then was lowered to the ocean floor.

The shoreward approximately 6000 feet of the line was trenched and buried. Depth of the pipe, when buried, ranged from 4 feet in deep water, to 15 feet in the surf area.

Cathodic protection of the line was provided, giving continuous protective current during both the welding and pulling cycles.

Results Encouraging. A significant footnote to this job is the fact that, in addition to the magnitude of the problems involved, crews had to contend with heavy swells of from 3 to 8 feet, and seas ranging an additional 2 to 6 feet. That adverse weather and sea conditions did not materially affect either cable laying or pipe pulling operations, is an indication that offshore pipelining operations has graduated into a year-round operation; not limited to calm water or ideal weather conditions. —**The End**

FIGURE 1—Even in open beakers, vapors above gasolines and JP-3 at 50° F. are above explosive mixture vapor pressure. Therefore, they are too rich to burn in the container.

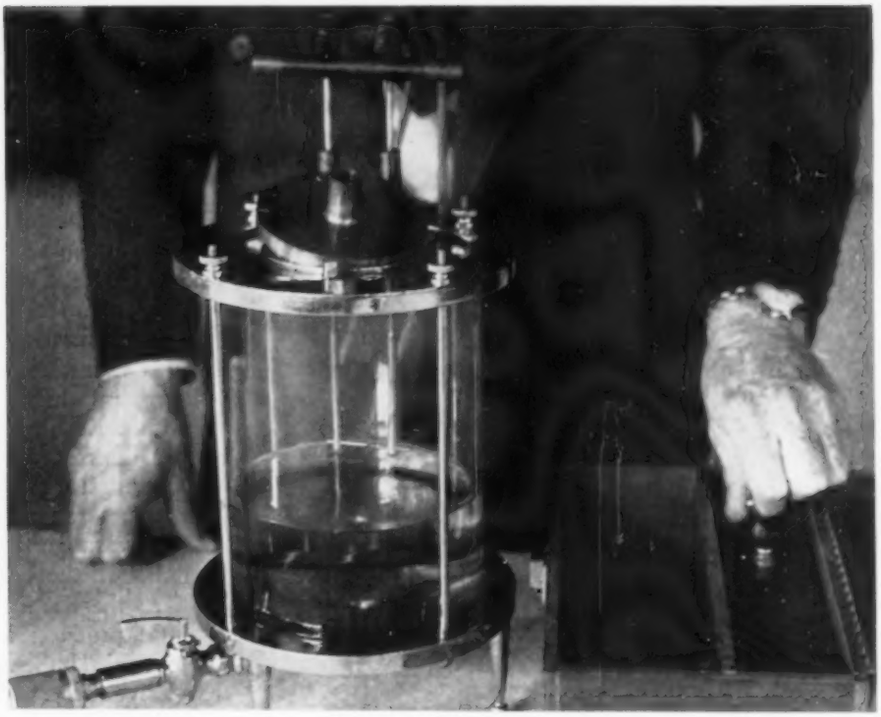


FIGURE 2—Small glass tank contains JP-R at a temperature of 50° F. When spark was turned on above the liquid, fire occurred and the explosion disarranged the roof at the top. At this temperature the explosive mixture vapor pressure had not been exceeded. In these particular tests, however, the vapors would not ignite when the product was at or above 60° F.

Fire Fighting Fundamentals

Safe Handling and Storage of Jet Fuels

Know the physical properties of each product and take its burning characteristics into consideration in every operation.

By J. L. RISINGER
Maplewood, N. J.

THERE HAS BEEN concern during the past four years about the added hazards in handling and storage of jet fuels.

Some of these fuels produce vapors within the explosive range near the surface of a container or tank at temperatures which, in the case of gasoline, the vapors would be too rich to burn—and in the case of kerosine and fuel oils, would be too lean to burn Some fear arises because of not understanding the burning characteristics of these fuels.

An attempt is made here to evaluate the characteristics of jet fuels in terms of their safe handling and storage. It is to be kept in mind that these fuels are simply petroleum products and they are as safe as other products when handled and stored in accordance with their characteristics.

Burning Characteristics. Many tests have been run, especially on JP-4, to determine when the vapors from this product are within the explosive or burning range, its flash point and other qualities which cause it to ignite under conditions slightly different from other products. Tests by various laboratories, Army, Navy, U. S. Bureau of Mines, individuals and others have not always come out to the same figures, because of variations in the product and conditions under which tests were made.

From a study of these tests, and some tests made by the writer, maximum of all ranges are used here. For instance, in the case of JP-4, tests made by the writer produced vapor in the container too rich to burn at 60° F., yet the maximum of other tests of 85° F. is used. It will also be noted that the old explosive range of the light products of from 1 percent to 6 percent by volume of vapor is not used, but the maximum range found by tests of the cracked and treated products.

Any plans for the safe handling and/or storage of petroleum or its products, must take into consideration the burning characteristics of the oil or gas involved. To

FIGURE 3—JP-1, JP-5 and kerosine do not produce vapor pressures to reach their bottom explosive limits at temperatures below 110° F. So when the torch is slowly submerged in them, it is extinguished instead of igniting the products.

them must be applied flashpoint, boiling points and ranges, vapor pressures, explosive ranges and other characteristics. To the comparison herein made with other products is added the explosive range temperatures. By this is meant the range of temperatures at which the oil in a container will produce and maintain a vapor air mixture near its surface that will ignite and burn or explode when a sufficient volume of heat at the required temperature is applied. This has no relation to whether the flames would travel back through a conservation vent into a tank since the vapors at the surface of the oil no doubt would be too rich to burn at a temperature of the oil to provide a pressure sufficient to open the vent.

It will be noted that each of the jet fuels have flash points similar to other products which have been handled and stored safely for many years. Thus, it is simple to handle these products with the same precautions used when handling the other products. For instance, JP-3, JP-4, JP-R should be handled in similar manner as gasoline, for when spilled, or ignition is applied at their open surfaces in a pit, they will take fire at temperatures as low as 0° F.

However, of chief concern is the low vapor pressures of some of these low flash point jet fuels. In a tank, therefore, these vapors may be within the explosive range, whereas at the same temperature, the vapors at the surface of gasoline would be too rich to burn, the vapor pressure having purged the air to below the percentage required to burn. (See Figures 1 and 2.)

Vapor Pressure and Explosive Range. Whether an oil in a tank will give off vapors sufficient to ignite at its surface and whether the mixture at the point will be too rich in vapors is dependent upon the vapor pressure of the oil. (See Figure 3.)

A small vapor pressure will provide sufficient vapors. A higher vapor pressure will force out the air to below that required for combustion. For these reasons, vapors at the surface of gasoline are too rich to burn except at a very low temperature of the gasoline.

On the other hand, some mixed products containing light ends of gasoline, even though they have a low flash point, will not have a vapor pressure sufficient to purge out the air and become too rich to burn except at a high temperature. Since the vapor pressure is produced or increased with a rise in temperature and eliminated or reduced with a lowering of the temperature, the term vapor pressure is indefinite unless the temperature of the oil is also given.

The Reid vapor pressure method is calculated on the basis of an oil temperature of 100° F. The symbol for this test method is RVP.

It is interesting to note that the range of vapor pressures in which the vapors from a petroleum product is within the explosive range is very narrow and that the top limit of this vapor pressure, which brings the vapor mixture to the top explosive range, is low. This vapor pressure range which produces a mixture within the explosive range from its bottom to its top is slightly different with the difference in width of the explosive range.

As there is little variation in the explosive range of the light products here used, one common range of vapor pressures in which the vapors would be within the explosive range is all inclusive. The lower limit of this pressure is about .2 pound per square inch. To allow a slight safety margin, .18 psi is used. The upper limit is about 1.5 psi. However, to allow a safety margin 1.8 psi is used.

At the RVP temperature of JP-4, the lower limit of vapor pressure of 2 psi, these vapors are above the top explosive range and therefore too rich to burn. Also, at the Reid vapor pressure temperature of JP-1 and JP-5, the vapor air mixture is still too lean to burn. (See Figure 4.)

The flash point of these oils in tanks are of little signifi-

FIVE KEYS TO SAFE HANDLING AND STORAGE OF JET FUELS

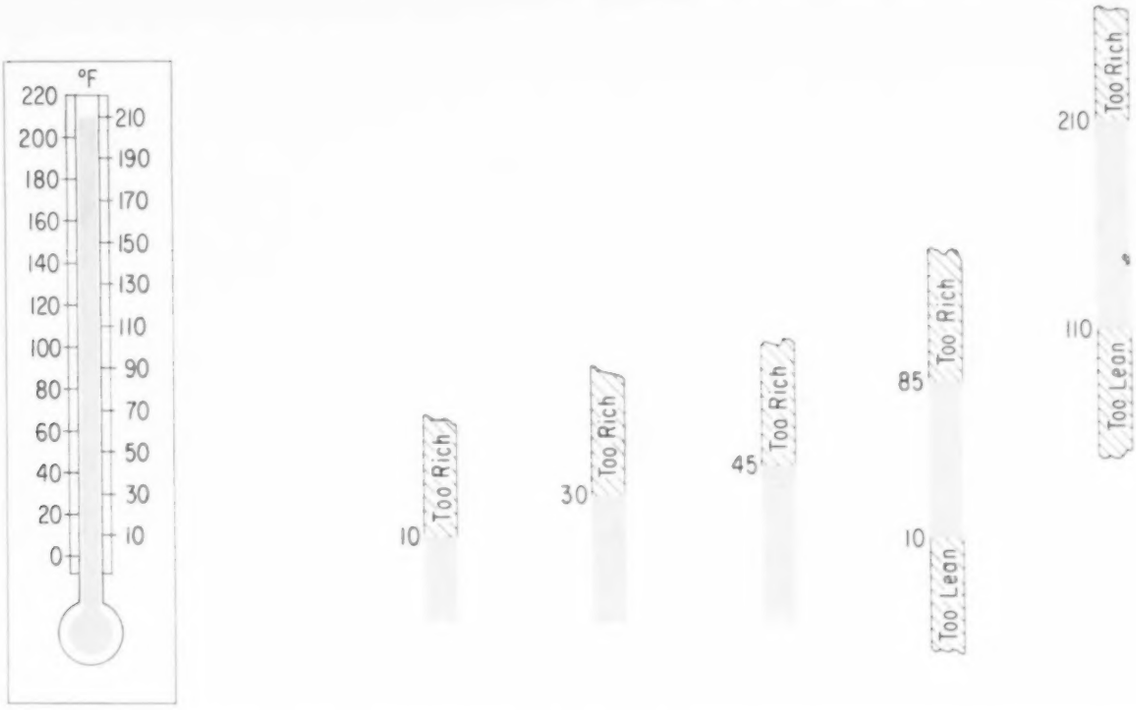
1. Safe handling and storage of jet fuels require consideration of their characteristics in the same manner as other petroleum products.

2. Safe handling of these products presents no special problem. JP-4 and JP-R produce vapors within the explosive range in a tank or container at a wide range of operating temperatures. Thus special provisions must be made to keep this explosive range from forming or to prevent static charge accumulation on the oil surface that would produce ignition sparks.

3. Where possible, JP-4 and JP-R should be stored in floating roof tanks and these roofs kept floating except during initial filling and repairs.

4. When these fuels are stored in cone roof tanks or when floating roofs are landed, extensive precautions are to be taken against turbulence and other factors that tend to accumulate static charges on the oil surface.

5. Bonding places the pipe through which hydrocarbons are flowing in the same potential with the container into which the oil is flowing, thus preventing an ignition spark. However, neither bonding nor grounding minimizes or affects the generation of a static charge on the surface of the oil.



Boiling Range	90—405	100—270	100—530	90—520	325—525
Reid Vapor Pressure	8—12	5.5—7	5—7	2—3	.1
Flash Point ASTM, °F	—0	—0	—0	—0	125
Explosive Limits, % Volume	1.4—7.6	1.1—7.2	1.3—7.8	1.0—7.0	0.7—6.0
Vapor Pressure Of Explosive Mixture	.18—1.8	.18—1.8	.18—1.8	.18—1.8	.18—1.8
Explosive Range Temperature	-0— +10	-0—+30	-0—+45	10—85	110—210
PRODUCT	MOTOR GASO.	AVIATION GASO.	JP-3	JP-4 JP-R	JP-1 JP-5 KEROSENE

FIGURE 4—Although N.F.P.A. explosive limits give these products a top limit of 6 percent volume of vapor, the U. S. Bureau of Mines scale calculated to take into consideration special condition possibilities is used. The bottom limit of explosive vapor mixture in kerosine, JP-1 and JP-5 takes into consideration the extreme conditions under which a mist (not vapors) might be present.

(Graph is taken from report prepared by V. L. Shipp.)

cance except to indicate the temperature from which to start in the producing a vapor pressure explosive range. The fire point, much higher than flash point in the low flash point oils, indicates the arrival at the lowest vapor pressure at which the vapor air mixture will be at the lower explosive limit of the oil.

In the chart, Figure 4, no bottom vapor pressure explosive range temperature is given for gasoline and JP-3. The temperatures at which an explosion or fire would be expected to occur would be somewhere between 10° and 30° F. below 0°.

Chief Source of Ignition. The chief ignition source of any product in an all steel gas tight correctly vented tank is static charge on the surface of the oil at a rate faster than it can normally bleed off to the shell of the tank. To have a fire or explosion in one of these tanks from this cause, the vapor air mixture must be within the explosive range at the point and time that the triggering energy occurs in the form of the spark jump from the non-conducting surface of the oil to a conductor.

To prevent such a fire or explosion, the vapor air mixture in correct proportion to ignite, must be kept out of the correct balance. Another method is to avoid the accumulation of static electricity on the surface of the oil faster than it can normally bleed off to the shell, other structures and the atmosphere.

In the discussion of safe handling and storage of jet fuels the characteristics of these oils to produce the correct vapor-air mixture to ignite, how these vapors might be ignited by static spark, and the prevention of these coming together at the same time and place will be explored.

It is indicated that the jet fuels that are most often within the explosive range temperatures in most parts of the world are JP-4 and JP-R. As these fuels are in one classification, reference to JP-4 will also include JP-R and other jet fuels when handled and stored at temperatures at which the vapor-air mixtures is correct for fire or explosion within the container.

The vapor-air mixture above the oil in a tank can be kept out of the flamable range by supplying an inert gas

in the vapor space to keep the oxygen content of the vapor space below that required. This space can also be kept too rich to burn by introduction of high vapor pressure flamable gases or vapors in to the vapor space.

The floating roof not only eliminates the vapor space but also the open surface on which a static electricity charge might accumulate. However, neither of these purposes are accomplished when the roof is not floating, but resting on its legs.

Static Electricity. For a static charge to be a source of ignition:

1. There must be a means of static generation. Examples of these are: separation of the trailing edge of a tire from the roadway upon which it is rolling; steam containing condensate or rust and issuing from a pipe; gases containing dust or rust and being discharged from a jet; and the discharge of hydrocarbons from the end of a pipe.

   Likewise, if a nonconducting liquid in a tank is subjected to turbulence, one portion of the material may be visualized as separating from another portion and static charges being generated. The latter two of these are the ones most involved in the problem of handling and storing of JP-4 and JP-R.

   Certain conditions either accentuate or mitigate the production of charges from the last mentioned source. These conditions include the type and degree of agitation or turbulence, and the presence and type of dispersion of water or other substances in the oil.
2. There must be a means of accumulation of a static charge on a nonconducting or insulated surface capable of producing ignition. Hazardous static charges can be accumulated only on a relatively well insulated body. The amount of accumulation of a static electricity charge depends upon the rate of generation and the rate of bleed off or discharge.
3. There must be a discharge of the accumulated charge across a gap or space to produce a spark of sufficient length to ignite. If the generation of static on an insulated surface is no faster than the capacitance to bleed or leak off, there will be no accumulation sufficient to produce the spark or ignition.

It is known that oil flowing through a pipe of a sufficient rate will accumulate a static charge sufficient to cause a static spark in a gap between the pipe and another conductor of a different potential. This is the reason for bonding the pipe to the container into which the oil is flowing, to keep the pipe and the container in the same potential.

Whether a static charge will be generated by a specific turbulence on one oil faster than on another has not been determined. It is known, however, that the rate of normal bleed-off is influenced greatly by the degree of conductivity of the oil, and the conductivity of the oil is increased by its water and impurity content. This is the reason for no experience of static accumulation on the surface of crude oil sufficient to cause a vapor explosion in a crude oil tank.

Bonding or grounding of the piping of the tank, or shell of the tank, will not minimize or effect the production of static electricity charge on the oil surface in the tank or lessen the difference in potential of these charges to the shell of the tank or other structures. Although bonding or grounding will prevent the receiving vessel from becoming charged, it serves no purpose in the prevention of the generation of a static charge on the surface of the oil, the reduction of the rate of its accumulation, nor prevent the production of an igniting spark from the surface of the oil to the shell of the tank or other structure.

In the prevention of static ignition of jet fuels flowing through pipes the same precautions are to be used in the case of JP-3, JP-4 and JP-R as for gasoline. However, in the case of filling a tank truck and other such container with JP4, there is a greater possibility of vapors being within the explosive range down in the container. Therefore, more emphasis should be placed on proper bonding between fill spouts and containers. In filling tank vehicles with JP-4, the fill stem should continuously contact the bottom of the compartment.

Storage in Floating Roof Tanks. The safest type tank in which to store JP-4 and JP-R is the approved floating roof tank. However, even when storing these fuels in floating roof tanks, certain precautions are to be observed. As long as the roof is floating, vapors within the explosive range (except under some type seals) is eliminated and open surfaces of sufficient area to accumulate dangerous static charges do not exist.

Since the vapor space under the seals of floating roof tanks containing these fuels are more likely to be within the explosive range, special attention should be given to roof design. Above all, there should be no vapor space under the seal subject to production of sparking from induced charge from lightning flashes. Extensive tests are being run by manufacturers on effective means of bridging the seal with a sufficient number and capacity channels to carry these charges to the shell above the seal.

In a number of the early floating roof designs, hangers above the seal, and network of wires between them apparently bled these charges to the shell and to the atmosphere to such an extent there were very few lightning ignited rim fires in these tanks. Some floating roofs are designed without vapor space under the seal.

In addition to attention to design, the following suggestions are offered for prevention of static ignition of JP-4 and JP-R in floating roof tanks.

1. Keep the roof floating at all times. Except when pumping out for repairs, never pump the tank below its landing so that there is an open surface below the roof.
2. At low levels, pumping in causes greater turbulence. Also at the start of pumping in there is more likely to be air or water in the line and other conditions may prevail which are more conducive to static accumulation on the surface of the oil than when the oil in the tank has greater depths.
   a. Pay special attention to filling the tank to roof floating depth by gravitating if possible, and if not, by pumping in at a very slow rate. The rate of three feet per second velocity should be maximum. The gallons per minute or hour can easily be figured on the basis of the size of the nozzle through which the oil is being pumped.
   b. When pumping in to the tank to float the roof, observe all of the precautions as though pumping in to a cone roof tank.
   c. Whenever possible avoid top gaging or sampling

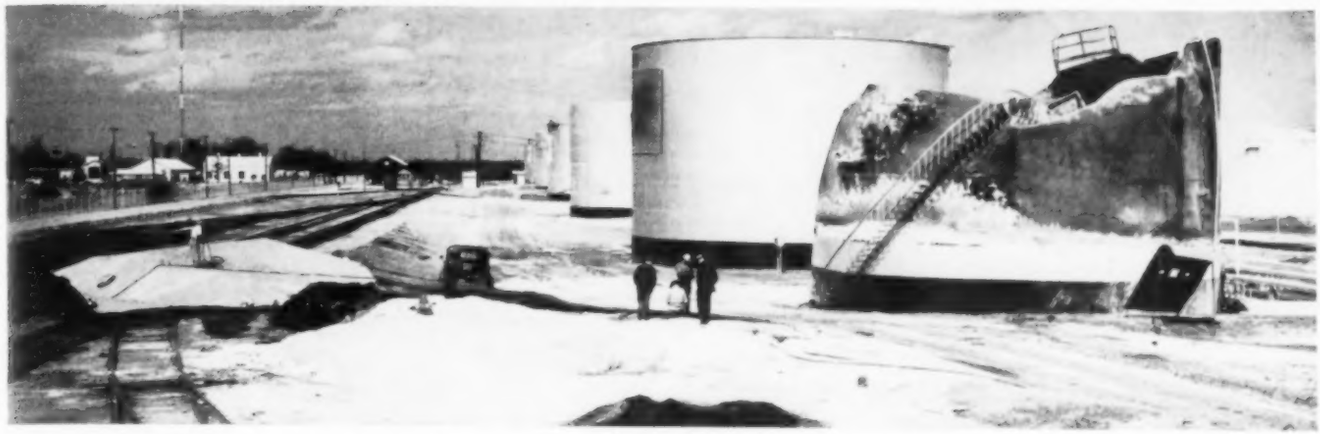


FIGURE 5—JP-4 was being pumped into this tank when roof blew and landed a distance away from the tank. An eight-foot depth had been attained when the explosion occurred. The JP-4 had a temperature in the 60's. Investigations indicated that the swing line was disrupted, delaying fire extinguishment. Fire was extinguished by use of 2½-inch foam nozzle.

when the roof is landed. Do not hand gage or sample in the usual manner a tank that is receiving, and in which the roof is not floating, until at least 20 minutes after in flow is stopped, thus permitting possible static charge to dissipate.

Storage of JP-4 and JP-R in Cone Roof Tanks. These products can be pumped into and stored safely in all steel gas tight cone roof tanks. In this case, there is a much greater probability of explosion than with the floating roof tank. Therefore, the trend toward storing in floating roof tanks should be as rapid as possible.

In the meantime, all precautions against accumulation of static charge on the surface of the oil should be taken, and all who pump in and store these products in cone roof tanks should be trained in correct procedure to prevent fires and explosions. Also, precautions should be taken for the protection of personnel should one of these fires or explosions occur.

The tanks should be correct in design and construction and maintained to this standard:

1. Avoid storing JP-4 in cone roof tanks. Where storing must be done in cone roof tanks, they should be of all steel, gas tight construction. They should be adequately vented with approved conservation vents or vents with flame arresters in accordance with the N.F.P.A. specifications for tanks containing oil with flashpoints not over 70° F.
2. The tank should be maintained with shell stronger than the roof so that in case of an explosion in the tank the roof will rupture or blow off without rupturing the shell below liquid level, or pulling the shell loose from the bottom.

Precautions applicable to cone roof tanks and floating roof tanks when the roof is landed.

1. Water bottoms should not be permitted in tanks containing jet fuels. The agitation of these bottoms is very conducive to static charge accumulation on the surface of the oil and may thus cause explosion at temperatures in which the vapors are within the explosive range.
2. The prevailing practice of the oil industry is to always pump the products in to the tank through bottom terminating lines. This should be strictly adhered to in pumping JP-4 into a tank or introducing water into the tank for the purpose of floating the product to the suction line.

During 1955, a 30-foot tank blew its roof over a 35-foot high, electric line when water was introduced into a tank through a hose terminating two feet inside the top manhole. The depth of the product with similar characteristics as JP-4, was 8 inches floating on a water bottom. When pumping through swing line make sure the line is at bottom position. (See Figure 5.)

3. Never pump into a tank at a rate which will cause severe turbulence of JP-4. Limit outlet velocity of incoming stream to three-feet or less per second until roof of floater is floating, or in cone roof tanks until incoming nozzle is covered to a depth of six feet.
4. Never agitate the contents of the tank with open surface, with air, inert or flamable gases.
5. Avoid any type blending operations in cone roof tanks or in floating roof tanks when roof is landed. If blending of JP-4 must be done in cone roof tanks, or in floating roof tanks while roof is landed.
   a. Make sure there is no water bottom.
   b. Pump in gasoline-like stock first so that vapors near the surface of the product will be maintained at a vapor-air mixture too rich to burn until roof is floating or until oil is of safe depth against the blending turbulence.
   c. In such blending use devices to circulate the oil horizontally around the shell of the tank in a manner to avoid surface turbulence, and more rapidly bleed the static charge to the shell of the tank.
6. Prevent air or vapor slugs from entering the tank from pipe lines. These slugs can be vented off before the receiving line stream enters the tank.
7. Prevent water or any aqueous solution from entering the tank with receiving streams, and drain all water possible after water washing a storage tank.

It is to be understood that the findings and suggestions contained herein are my own although they may be summed up in some cases of findings of several groups. They are offered here as a matter of information only and with the hope that this information will be of assistance to you in the solution to the problem of handling and storage of products with similar characteristics as those described. With respect to the static electricity part of the story, reference is made to "Protection Against Ignition Arising Out of Static, Lightning and Stray Currents." American Petroleum Institute, 50 West 50th Street, New York 20, N. Y.—J. L. R.

Liquid and Gas ΔP by Nomogram

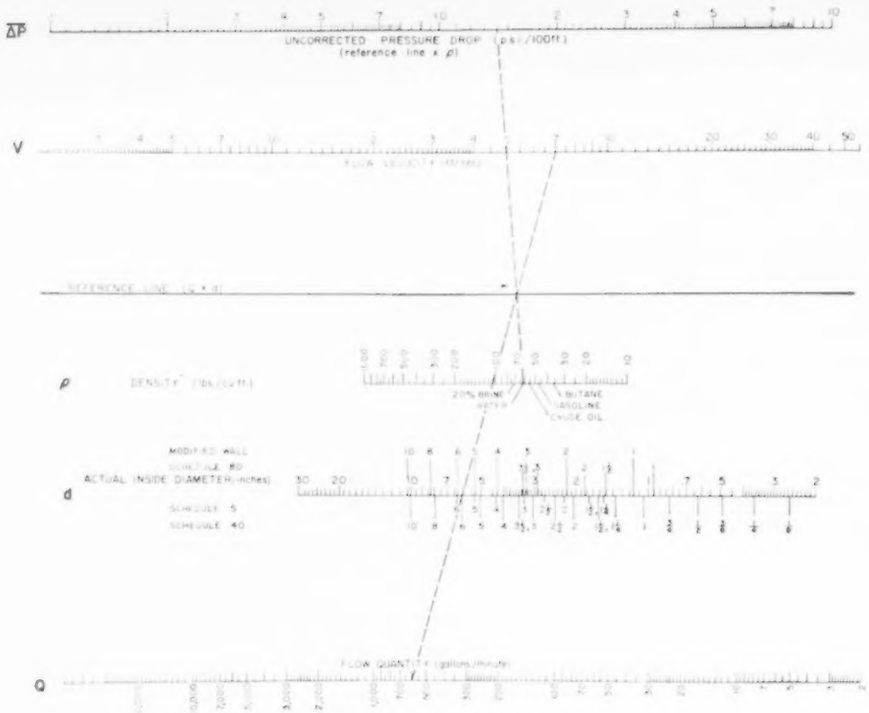


FIGURE 1a—How to calculate uncorrected pressure drop for liquid flow.

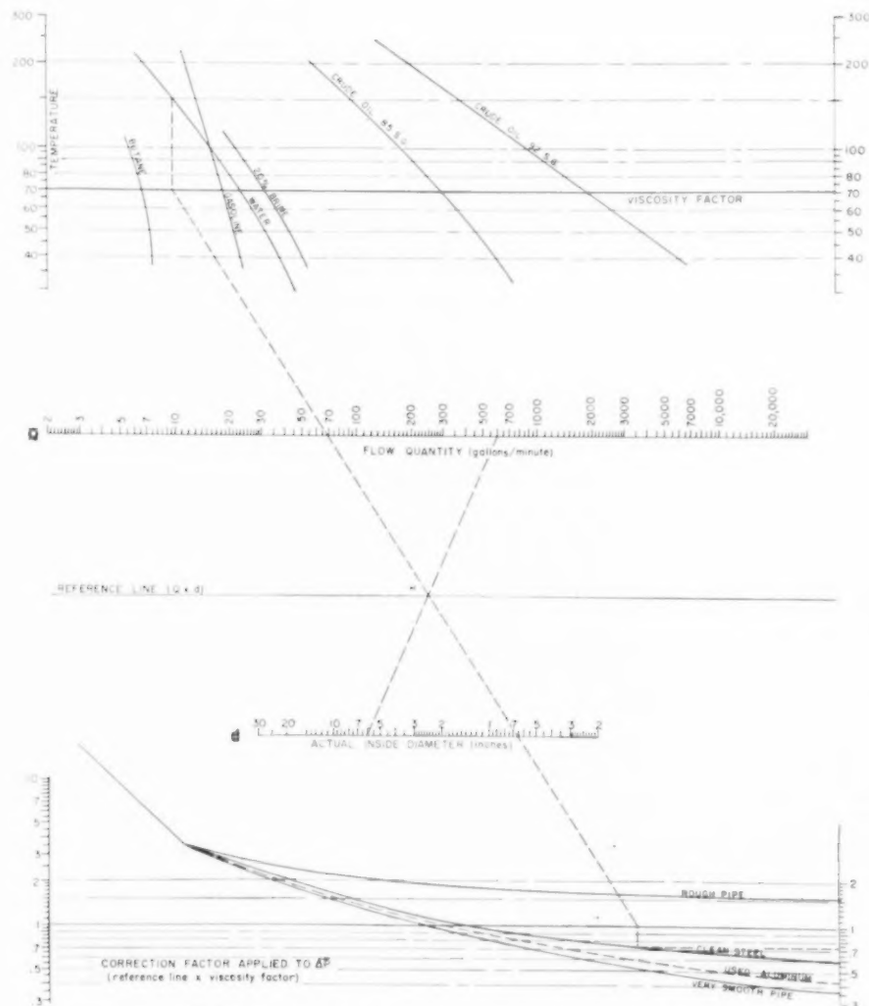


FIGURE 1b—How to get the correction factor for liquid flow.

By R. W. FLOURNOY
Reynolds Metals Company
Louisville, Ky.

LIQUIDS

Figures 1a and 1b are used for determining the pressure drop in piping caused by friction of liquids flowing through a straight pipe. These charts are for turbulent flow only (Reynolds number > 2100). The corrected pressure drop, ΔP, in psi per 100 feet is expressed as follows:

$$\Delta P = 0.518 \frac{f\rho V^2}{d} = 0.0864 \frac{f\rho Q^2}{d^5}$$

Problem. Find the fluid velocity and pressure drop per 100 feet of 6-inch standard steel pipe carrying 600 gpm of water 150° F.

Rapid Estimate. On Figure 1a, connect 600 gpm on Q scale with 6-inch

(steel pipe) on left side of d scale, extending line to Flow Velocity scale which indicates 7 feet per second. Mark the intercept (x) with the reference line and then connect x with "water" on ρ (density) scale, extending line to ΔP line. Uncorrected Pressure Drop indicates a value of 1.40 psi per 100 feet of pipe.

Accurate Solution. On Figure 1b, connect 600 gpm on Q scale with 6.065 inch (I.D.) on the d scale, marking intercept (x) on reference line. Next go to the uppermost graph on Figure 1b to the curve representing the liquid being used. On this curve, at the temperature of the flowing fluid, extend a vertical line to the viscosity factor line. Connect this intersection with x and extend this line to the Correction Factor Line (value of 1.0). Now extend this line vertically to the desired pipe classification, then horizontally to get the correction factor. In the case of this problem the correction factor is 0.7. The corrected pressure drop is then $\Delta P = 1.40 \times 0.7 = 0.98$ psi per 100 feet.

GASES AND VAPORS

Figures 2a, 2b and 2c comprise a nomograph for determining the pressure drop of gases flowing in straight pipes. The corrected pressure drop ΔP in psi per 100 feet is expressed as follows:

$$\Delta P = \frac{143.8\, f\, \rho\, (V')^2}{d} = 0.00134\, \frac{f\, v\, w^2}{d^5}$$

I. How to Get the Specific Volume. Figure 2a can also be used to determine the specific volume of gases v from the molecular weight M, the pressure p and temperature t.

Problem: Find the specific volume of methane gas at standard conditions; atmospheric pressure and 60° F.

Solution: Use Figure 2a. Connect 60° F on scale t with 0 on scale P, extending the line to the intercept (x) of the reference line. Connect x with the value for methane (molecular weight 16) on line M, marking the intercept on line v. On v read 23 cubic feet per pound as the specific

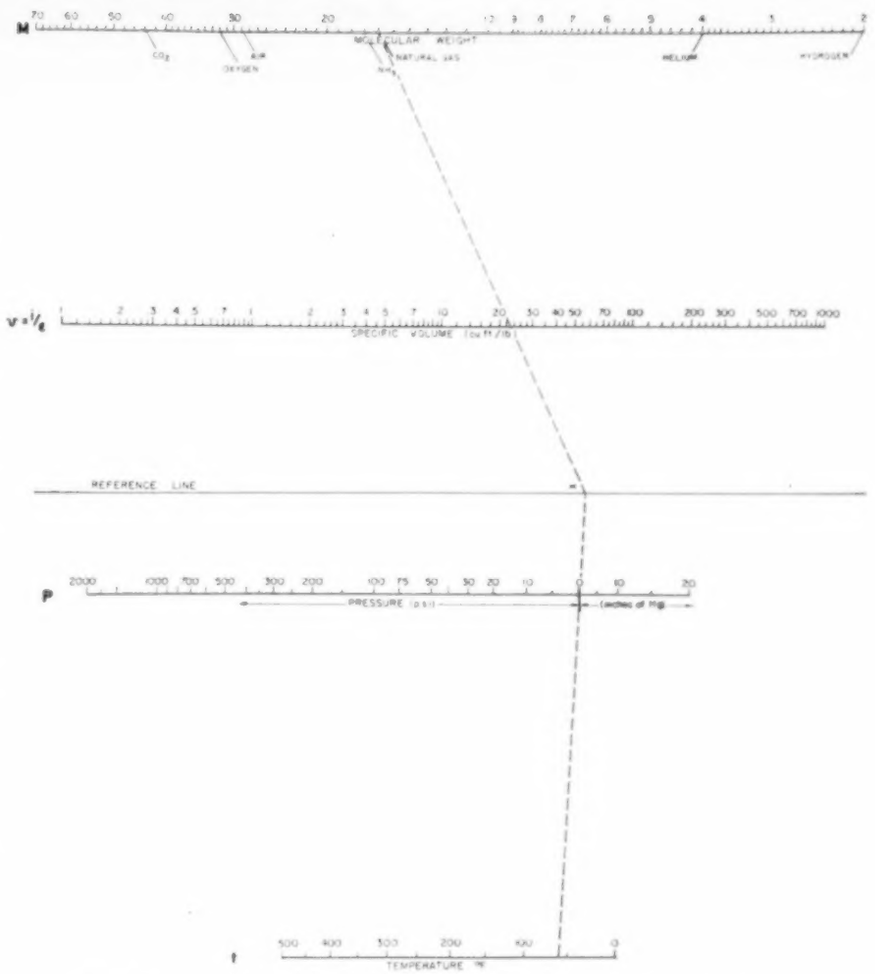


FIGURE 2a—A rapid method of obtaining the specific volumes of gases and vapors.

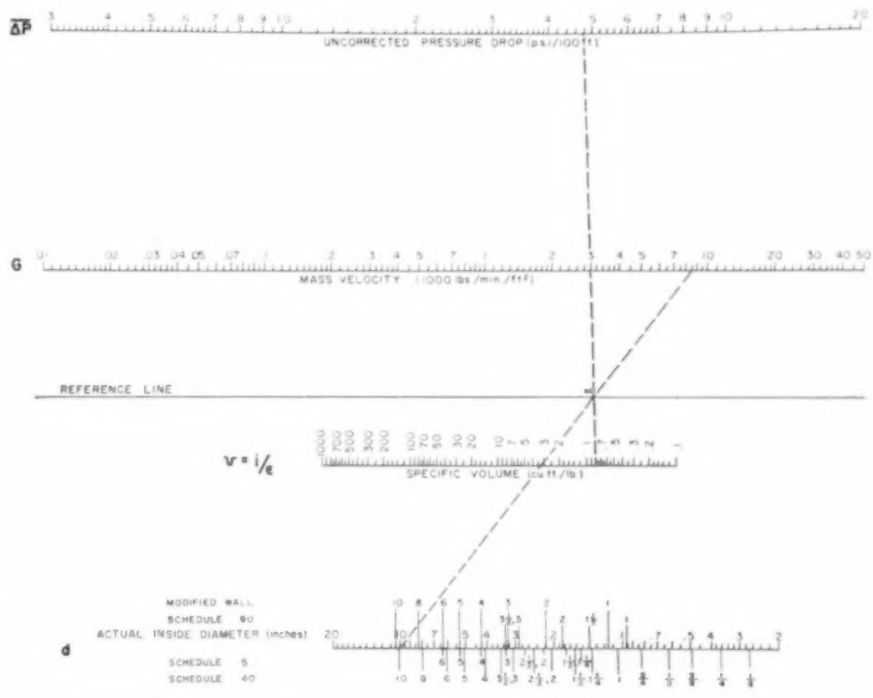


FIGURE 2b—How to calculate the uncorrected pressure drop for gases and vapors.

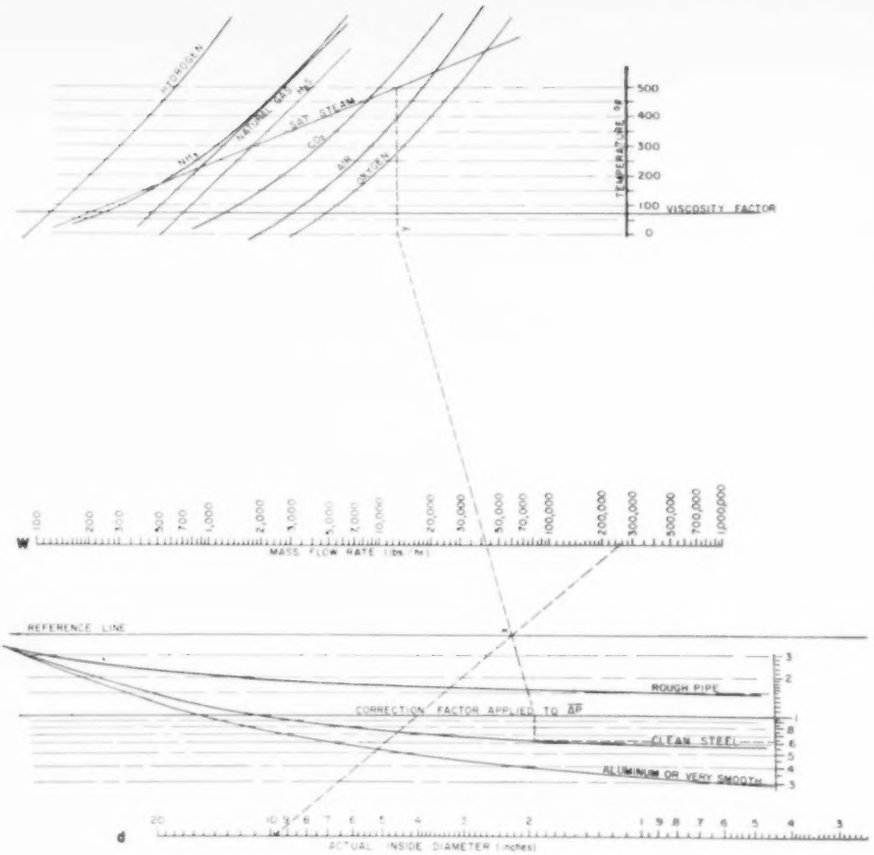


FIGURE 2c—Correction factors for gas and vapor flow.

volume of methane under standard conditions.

II. How to Get ΔP for Vapors and Gases.

Figure 2b provides a rapid estimate of pressure drop in straight piping handling gas. Chart 2c should be used for more accurate solution using Correction Factors for pipe friction.

Problem: Find the pressure drop per 100 feet of pipe and the velocity of steam carried in 10 inch Schedule 80 steel pipe at a rate of 250,000 pounds per hour at 600 psig and 500° F.

Rapid Estimate. By reference to steam tables, find the specific volume of steam as 0.79 cubic feet per pound at 600 psig and 500° F.

On Figure 2b, connect 9.75 inches (I.D. of Schedule 80 steel pipe) on the d scale, with 8.5 × 1000 on the mass velocity scale. Mark the intercept (x) of the extended line on the reference line. Note that the mass velocity was 8.5 × 1000 lbs. min./sq. ft. If this is multiplied by the specific volume of 0.79 cubic feet per pound the result will be the velocity of 6700 feet per minute which is one of the answers desired.

To get the uncorrected pressure, connect x with 0.79 on the v scale extending the line to the Uncorrected Pressure Drop line marking the intercept which is $\overline{\Delta P}$ = 4.8 psi per 100 feet.

Accurate Solution. On Figure 2c, connect 250,000 on w scale with 9.56 inches on d scale marking intercept (x) on the reference line. Go down vertically from the saturated steam at 500 F, to the Viscosity Factor line at intercept (y). Connect y with x and extend line to "Correction Factor" reference line. Draw a vertical line from the intercept to "clean steel" curve and a horizontal line from this intercept to 0.6 Correction Factor. The corrected pressure drop is 4.8 × 0.6 = 3.88 psi per 100 feet.

III. For Long Pipe Lengths.

The use of the nomographs for long gas piping systems may require corrections for the change in gas pressure through the piping. This can be accomplished by dividing the piping length into several lengths in which the pressure drop does not exceed 15 percent of the initial pressure. Calculations are made for each section of the line. Calculations for liquid lines do not generally require such correction.

NOMENCLATURE

- f = Fanning friction coefficient
- $\rho = 1/v$ = fluid density in lbs. per cu. ft.
- V = average fluid velocity in feet per second
- V′ = average fluid velocity, 1000 feet per minute
- Q = fluid flow in gallons per minute
- w = mass rate of flow, lbs. per hour
- d = inside diameter of pipe, inches.
- ΔP = pressure drop, psi per 100 feet

ACKNOWLEDGMENT

The nomograms in this article have been adapted from the Engineering and Data Book Number 211, published by Tube Turns, Inc., Louisville, Ky.

About the Author

ROWLAND W. FLOURNOY is chief chemical engineer in the Engineering Service department of Reynolds Metals Co., Louisville. In this capacity he provides engineering services for the chemical processing and petroleum industries. Flournoy received his B.S. degree in chemical engineering in 1935 from Kansas State College, then in 1936 he joined Colgate Palmolive Co. where he spent the next six years. In 1942 he joined Spencer Chemical Co. as a technical supervisor, then in 1945 he moved to Corn Products Refining Co. where he remained for the 12 years prior to becoming associated with Reynolds Metals Co.

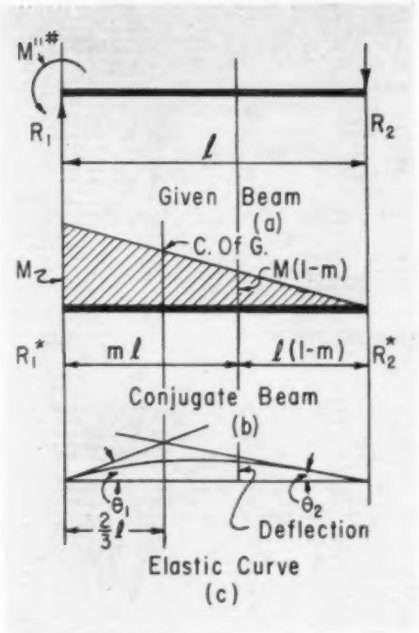


FIGURE 19—Given and conjugate beams reacting under an applied couple.

TABLE 8

Value of m	Value of G
.1	4.10
.2	6.91
.3	8.57
.4	9.22
.5	9.0
.6	8.06
.7	6.55
.8	4.61
.9	2.38
1.0	0

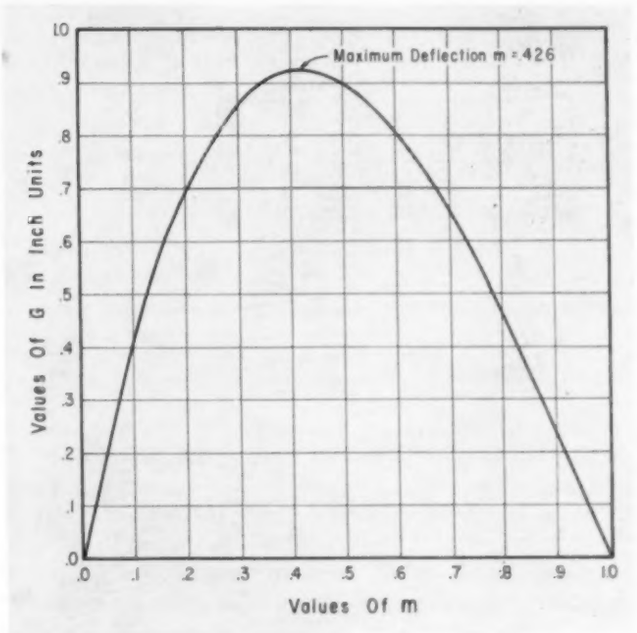


FIGURE 20—Deflection coefficients for simple beam reacting under a couple applied to the left support.

Find Beam Deflections by Easy Methods

This method will simplify solution of problems involving applied couples and restrained beams.

By **CHARLES H. FORK,** Ralph M. Parsons Company, Los Angeles

THE FIRST TWO PARTS of this series described simple methods of determining areas of moment diagrams, deflection of simple beams reacting under a uniform load, deflection under concentrated loads and the deflection of cantilever beams reacting under uniform loading. This article will describe easy methods of determining the effect of applied couples to simple beams, the deflection when a couple is applied to simple beams, simple beams reacting under several concentrated loads and the deflection of restrained beams.

Applied Couple, Simple Beam. To determine the applied couple at the left support, for a simple beam (Figure 19), the angular deflection (Θ) must first be derived:

From fundamental principles:

$$\Theta_1 = \frac{R_1^*}{EI} \text{ and } \Theta_2 = \frac{R_2^*}{EI}$$

That is, the angular deflection at the supports is equal to the reaction of the conjugate beam divided by EI.

$d = \frac{M^*}{EI}$ or, the deflection at any point is equal to the bending moment of the conjugate beam divided by EI.

$$R_1^* = \frac{Ml}{2} \cdot \frac{2}{3} = \frac{Ml}{3} \text{ and } R_2^* = \frac{Ml}{6}$$

Then, $\Theta_1 = \frac{Ml}{3\,EI}$ ..... Equation 19

And, $\Theta_2 = \frac{Ml}{6\,EI}$ ..... Equation 20

The bending moment at ml distance from the left support is:

$$M^* = \frac{Ml}{6} \cdot l\,(1-m) - M\,(1-m) \cdot l\left(\frac{1-m}{2}\right)\frac{1}{3}\,l\,(1-m)$$

or, $M^* = Ml^2\left[\frac{(1-m)-(1-m)^3}{6}\right]$

Multiplying the coefficient of Ml^2 by 144, reducing to inch units and allowing this expression to be denoted by "G", then $G = \frac{144}{6}[(1-m)-(1-m)^3]$

Then $BM^1 = GMl^2$

Then $d = \frac{GMl^2}{EI}$ ..... Equation 21

Values of "G" have been calculated for values of m ranging from 0 to 1.0. They are found in Table 8 and are shown on the graph in Figure 20. *Continued on Next Page*

Part 3

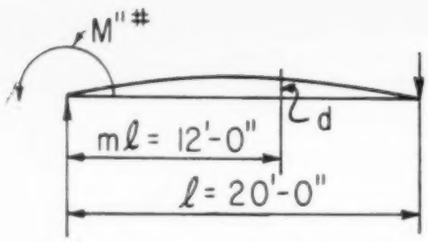


FIGURE 21

Example: Determine the deflection 12'-0" from the left support (Figure 21), where M = 200,000 in lbs., l = 20'-0", ml = 12'-0", E = 30,000,000 and I = 125.

Then from Figure 20 or Table 8, G = 8.06

$$\text{Therefore } d = \frac{8.06 \times 200{,}000 \times 20}{30{,}000{,}000 \times 125} = .172$$

Values of "G" are in inch units. Divide the values of "G" by 144 to convert to foot units. Thus, when m = .5,

$$G = \frac{9.0}{144} = \frac{1}{16} \text{ or } d = \frac{1}{16}\,\frac{Ml^2}{EI}$$

Simple Beam With Several Loads. To determine the natural frequency of a simple beam reacting under several loads, the energy method may be used.

TABLE 9

LOAD	y	y^2	P_y	P_{y2}	$\frac{P_y}{P_{y2}}$
P_1 = 8000	.497	.247	3970	1975	2.01
P_2 = 4000	.581	.326	2322	1305	1.78
P_3 = 6000	.366	.134	2200	816	2.70

$$\Sigma \frac{P_y}{P_{y2}} = 6.49$$

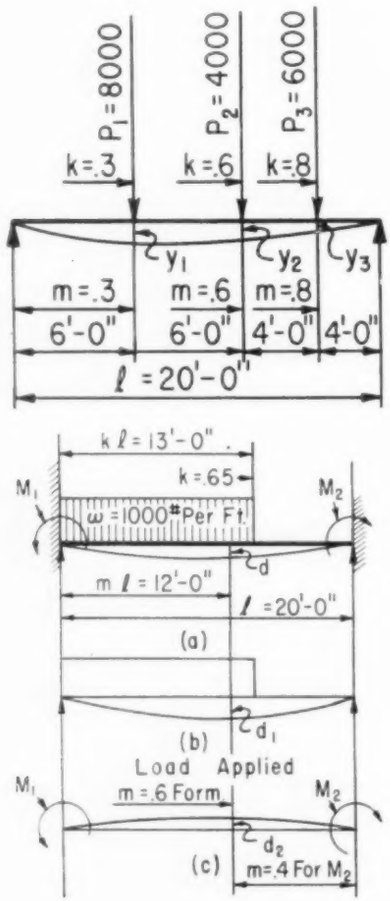


FIGURE 22—Simple beam reacting under several concentrated loads.

FIGURE 23—Simple, restrained beam, uniformly loaded over part of the span.

$$fn = \frac{1}{2\pi}\sqrt{\frac{g\Sigma P_y}{\Sigma P_y^2}} \text{ cycles per second.}^1$$

The general formula for the static deflection of each load is:

$$y = \frac{l^3}{EI}[J_1P_1 + J_2P_2 + J_3P_3]$$

The values of "J" may be obtained from Figure 12, Part 2 of this series.

Example: Given: A steel beam with I = 2135, E = 30,000,000, l in ft. (see Figure 22), g = 386 inches per second per second and y in inches.

$$\frac{l^3}{EI} = 1.25 \times 10^{-7}$$

	k	J	P	JP	y_1
m = .3	.3	25.4	× 8000 =	203,000 × 1.25 × 10^{-7} =	.254"
	.6	25.9	× 4000 =	103,000 × 1.25 × 10^{-7} =	.130"
	.8	15.03	× 6000 =	90,200 × 1.25 × 10^{-7} =	.113"
				Σy_1 =	.497"

	k	J	P	JP	y_2
m = .6	.3	25.9	× 8000 =	207,000 × 1.25 × 10^{-7} =	.259"
	.6	33.2	× 4000 =	133,000 × 1.25 × 10^{-7} =	.166"
	.8	20.73	× 6000 =	124,500 × 1.25 × 10^{-7} =	.156"
				Σy_2 =	.581"

	k	J	P	JP	y_3
m = .8	.3	15.03	× 8000 =	120,300 × 1.25 × 10^{-7} =	.151"
	.6	20.73	× 4000 =	83,000 × 1.25 × 10^{-7} =	.104"
	.8	14.75	× 6000 =	88,500 × 1.25 × 10^{-7} =	.111"
				Σy_3 =	.366"

For summation of $\frac{\Sigma P_y}{\Sigma P_y^2}$ see Table 9.

Therefore, the frequency of the beam is:

$$fn = \frac{1}{6.28}\sqrt{386 \times 6.9} = 8.22 \text{ cycles per second.}$$

Deflection of Restrained Beams. The deflection of a fixed or restrained beam, reacting under a uniformly distributed load, is obtained by adding algebraically the results of the simple cases shown in Figure 23b and 23c.

Thus, "d", the actual deflection, equals $d_1 - d_2$

or, $d = d_1 - d_2$

$$d_1 = \frac{Fwl^4}{EI}$$

$$d_2 = \frac{G_1M_1l^2}{EI} + \frac{G_2M_2l^2}{EI}$$

$$\text{Then } d = \frac{Fwl^4}{EI} - \left(\frac{G_1M_1l^2}{EI} + \frac{G_2M_2l^2}{EI}\right) \text{.....Equation 22}$$

Example: For Figure 23b, k = .65, m = .6, then F = 15.2

$$d_1 = \frac{15.2 \times 1000 \times 20^4}{30{,}000{,}000 \times 213.5} = .282 \text{ inches}$$ (deflection resulting from the load applied, Figure 23b.)

The deflection resulting from moments M_1 and M_2 being applied are shown in Figure 23c.

For M_1, m = .6 and G_1 = 8.06
For M_2, m = .4 and G_2 = 9.22
Where M_1 = 350,000 inch pounds
and, M_2 = 221,000 inch pounds

$$d_2 = \frac{8.06 \times 350{,}000 \times 20^2}{30{,}000{,}000 \times 213.5} + \frac{9.22 \times 221{,}000 \times 20^2}{30{,}000{,}000 \times 213.5} = .305 \text{ inches}$$

Therefore, d = .382 — .305 = .077 inches

REFERENCE

[1] Freberg and Kemler, Elements of Mechanical Vibration, John Wiley & Sons, Inc., 1943.

ACKNOWLEDGMENT

From a privately circulated book by Charles H. Fork entitled "Structural Design Data on Deflection of Beams" upon which the author holds the copyright.

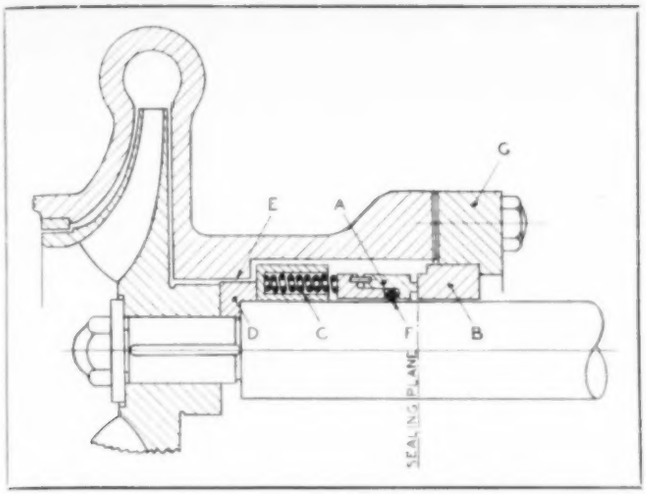


FIGURE 1—Basic elements of a mechanical seal.

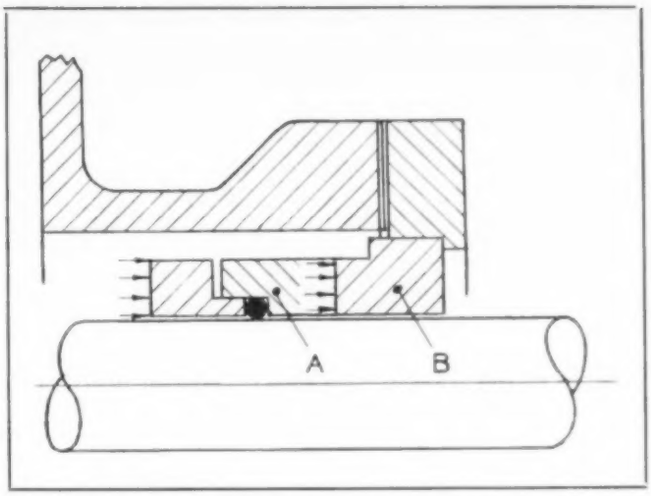


FIGURE 2—The stuffing box pressure is transmitted through rotating element *A* to stationary element *B*.

Facts About Pump Packings and Seals

Operations Handbook

1 Packing Boxes and Glands
2 Packings
3 Mechanical Seals
4 Mechanical Seal Maintenance
5 Packing Maintenance

Here is a complete discussion of design features of various types of mechanical seals for centrifugal pumps. It will be a valuable guide in selecting the right seal for your particular pumping application.

By HAROLD WOODHOUSE
Dean Hill Pump Company
Indianapolis

THE MECHANICAL SEAL may be described as a precision machined mechanical device used as an alternative to soft shaft packing in centrifugal pumps. The mechanical seal did not burst on the pump world as a fully developed, single idea invention. It has evolved slowly after being born out of the necessity for improving the sealing afforded by conventional packing on difficult applications.

The basic elements of a mechanical seal are shown as in Figure 1. The sealing plane occurs where the rotary sealing element *A* contacts stationary sealing element *B*. Contact of the sealing faces is maintained by Spring *C* which is held in the correct state of compression by distance piece *D* made to the proper length. Sometimes, to limit the flow in the event of complete failure of the seal, a restricted running clearance is provided ahead of the seal as at *E*. To prevent leakage along the shaft a ring of soft material, such as neoprene, is compressed at *F*. The stationary sealing face *B* is usually held in gland plate *G*.

All mechanical seal designs are variants of this arrangement. They may be described as single or double —Figure 1 is a single seal; a double seal is essentially two single seals mounted back to back—and balanced or unbalanced, which needs some explanation as follows:

In Figure 2 the entire hydraulic thrust resulting from the pressure existing in the stuffing box acting on the back of the rotating seal element *A* is transmitted across the sealing face to stationary element *B*. Because of the high thrust loading resulting from this entirely unbalanced force, this type of seal is restricted to conditions where a low stuffing box pressure exists. The actual value of the low pressure might be anything from a

pound or two up to, possibly, 120 pounds per square inch gage, depending on the dimensions of the seal.

Figure 3 illustrates a partially balanced seal. The contact face of *A* has been cut down so that some of the thrust load on the rear of *A* is neutralized by the stuffing box pressure acting in the opposite direction over the outer annulus of seal ring *A*. With the net thrust load on the seal faces reduced, it is possible to seal against higher stuffing box pressures. Such partially balanced seals are in very common use where the stuffing box pressures reach approximately 200 psig. It may seem repetitious to keep writing "stuffing box pressure" but it is important in specifying mechanical seals that only the pressure likely to be existing in the stuffing box be considered and not the discharge pressure. If, for instance, one specified seal pressure as the discharge pressure, one might be quoted a considerably more expensive seal to take care of a pressure which is never going to exist at the seal.

Figure 4 illustrates a fully balanced seal. By stepping down the shaft (or sleeve, if the seal is mounted on a shaft sleeve) the counterbalancing thrust force acting on the outer annulus of rotary seal ring *A* may be made as large as the thrust force on the rear of *A*. Such a balanced seal can be used for high pressure in the range of 1000 psig. In practice, seals are purposely not completely balanced. A 10 to 15 percent out-of-balance is preferred. The reason for this is that it is desirable to have a certain amount of out-of-balance pressure at all times to maintain contact of the seal faces in the event that the spring load of *C* on *A* (Figure 1) is decreased by loss of spring temper, or if the spring should break, or if the spacer or collar backing up the spring should move and release the compressive force exerted by the spring. Figure 5 shows an over balanced seal where the counteracting force on seal ring *A* annulus is greater than the force acting on the back of *A* so that contact of the seal faces is maintained only by the pressure of the spring. Such a seal would not be made for pump use.

The most important factor in the design of a mechanical seal is the choice of materials for the rotating and stationary seals. In services the rotating seal is carbon and the stationary one stellite. For water, carbon and bronze is common. Many other materials, such as ceramics are used with carbon for sealing against corrosive fluids.

Where Seals Should Be Used. Having described and illustrated the basic principles of mechanical seals one might proceed to inquire why and where should they be used:

1. Every maintenance man knows, or soon finds out, that a certain amount of liquid leakage must be allowed past the packing rings in a conventionally packed stuffing box; with mechanical seals the leakage is almost non-existent. This is advantageous because:
   a. Liquid leakage loss is a consideration where expensive liquids are being pumped.
   b. The pumping unit is cleaner so that a drip rim baseplate is not essential to collect packing box leakage to improve installation appearance.
   c. When pumping volatile liquids, such as hydrocarbons, the fire hazard is minimized.
   d. Operating personnel is protected from the danger of inhaling noxious fumes.
   e. Non-contamination of the fluid being pumped. To achieve this non-contamination, it is sometimes necessary, particularly where a non-lubricating type of liquid is being handled, to use a double seal arrangement with a coolant introduced between the two seals as shown in Figure 6.
2. There is no rubbing friction on the shaft or shaft sleeves and this eliminates expensive rotor parts replacements. In this connection, one might add, when clear and non-corrosive liquids are being pumped, it is desirable to eliminate the use of shaft sleeves and mount the seals directly on the shaft. This removes the possibility of a liquid leakage short circuiting the mechanical seal by leaking along the shaft inside the sleeve bore.

   When conversion of an old pump having shaft sleeves is made from soft packing to mechanical seals it is often necessary to remove the shaft sleeves to provide room for the seals between the shaft diameter and the available packing box bore. This can also mean a replacement shaft is required with threads for impeller lock nuts at different locations.
3. A pump designed for mechanical seals alone can be made more compact thereby reducing the overall size, axial length and weight of the

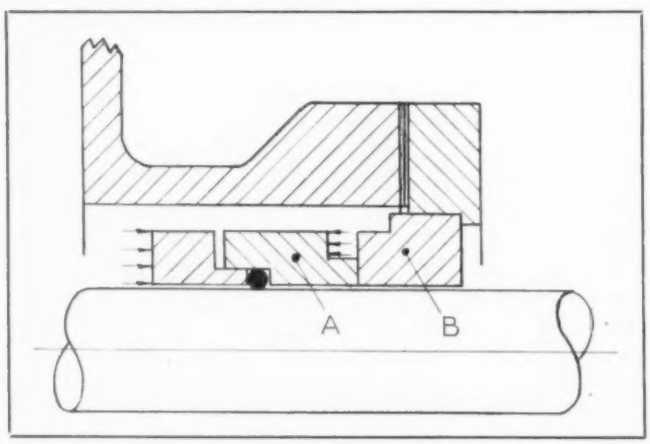


FIGURE 3—Partially balanced seal allows some of the thrust load to be applied to a cut face on the rotating element *A*.

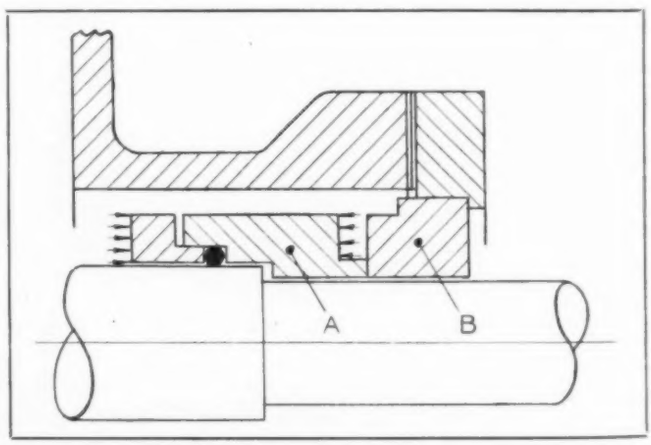


FIGURE 4—Fully balanced seal has counter-balancing thrust force acting on the outer annulus of *A* which is as large as the thrust force on the rear of *A*.

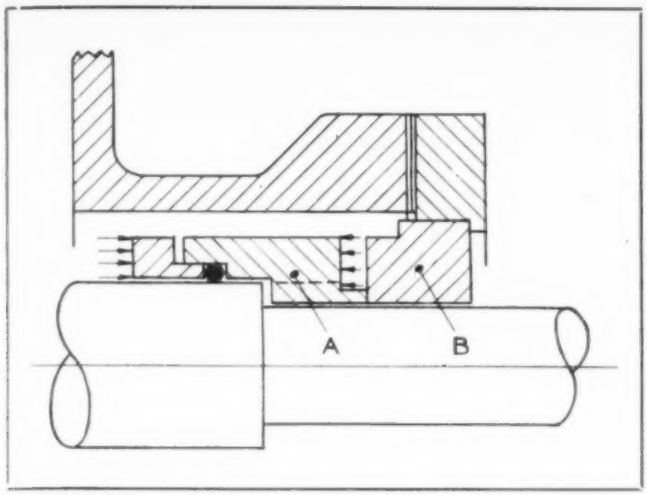


FIGURE 5—Over-balanced seal has counter-balancing force greater than the thrust force.

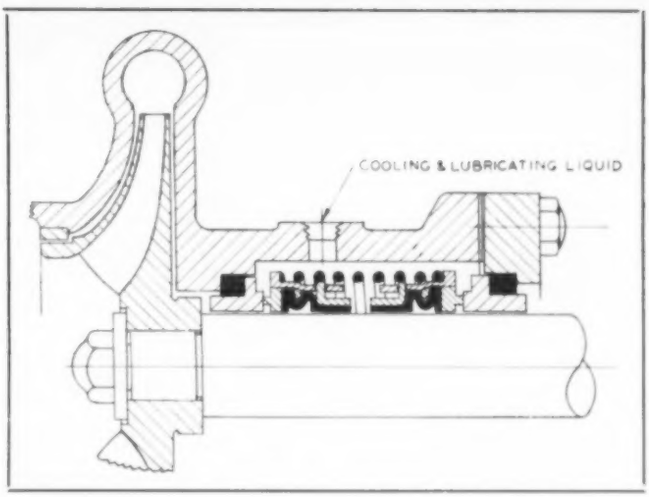


FIGURE 6—Double mechanical seals permit the handling of gritty liquids.

pump and conserving floor space. The shorter shaft becomes more rigid so the pump should be less susceptible to vibration troubles resulting from shaft deflections. It should be noted, however, that a great many pumps, although fitted with mechanical seals, are made so that, with the seals removed, standard soft packing may be used. The thinking at the back of this, as far as the operators are concerned is, probably, a certain amount of doubt about the reliability of mechanical seals for the particular application in mind; or the thought that should the mechanical seals break down, soft packing can immediately be installed whereas it might take weeks to get a replacement mechanical seal if none are carried in stock.

4. The area of rubbing surface of the seal is quite small. There is, therefore, less friction and this means a saving of power and an increase in pump efficiency.
5. The sealing surfaces are precision ground to an unusually high degree of smoothness. So no break-in runs are required with mechanical seals as with soft packing where the pump must run for a time with a more than usual leakage to permit the packing to seat and adjust itself to the shaft.
6. Burning and/or scoring of shaft or sleeves from too much or unequal tightening of packing gland bolts is eliminated.
7. The small contact area and negligible friction loss of mechanical seals makes them advantageous for high pressures and speeds. Already, at such moderate stuffing box pressures as 50 psig., considerable troubles are experienced with soft packing and considerable experimentation may be necessary to find the grade of packing which will perform satisfactorily in a given application.

Because of the relatively high pressure exerted by soft packing on shafts or sleeves (a pressure which must be increased as the stuffing box liquid pressure increases) it becomes more difficult to maintain a seal as the shaft rubbing speed or stuffing box pressure increases. The liquid film, essential to packing lubrication, is more difficult to maintain. Under high pressure a soft packing may be extruded from the stuffing box.

8. Because the rotating seal element of a mechanical seal is flexibly mounted and maintained in contact with the stationary element by spring pressure, it can adjust itself automatically to shaft whip, axial end play and seal face wear.
9. Double mechanical seals permit the handling of gritty liquids, high vacuums and applications where there is inadequate lubrication. Such an arrangement is shown by Figure 6. It consists of two bellows type mechanical seals placed back to back in a stuffing box. Leakage from the impeller space into the

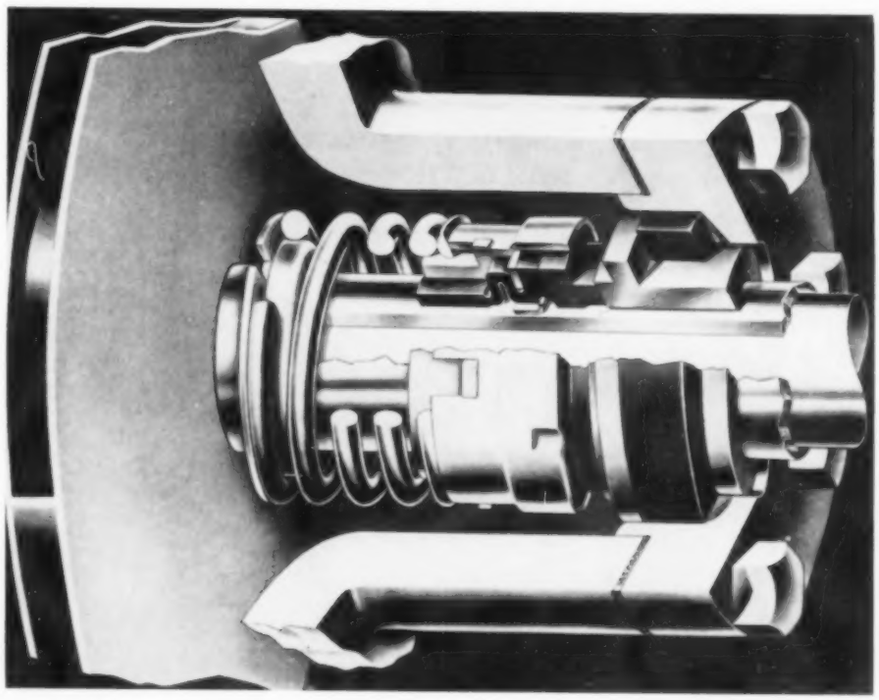


FIGURE 7—Double mechanical seals have a neoprene or buna type bellows.

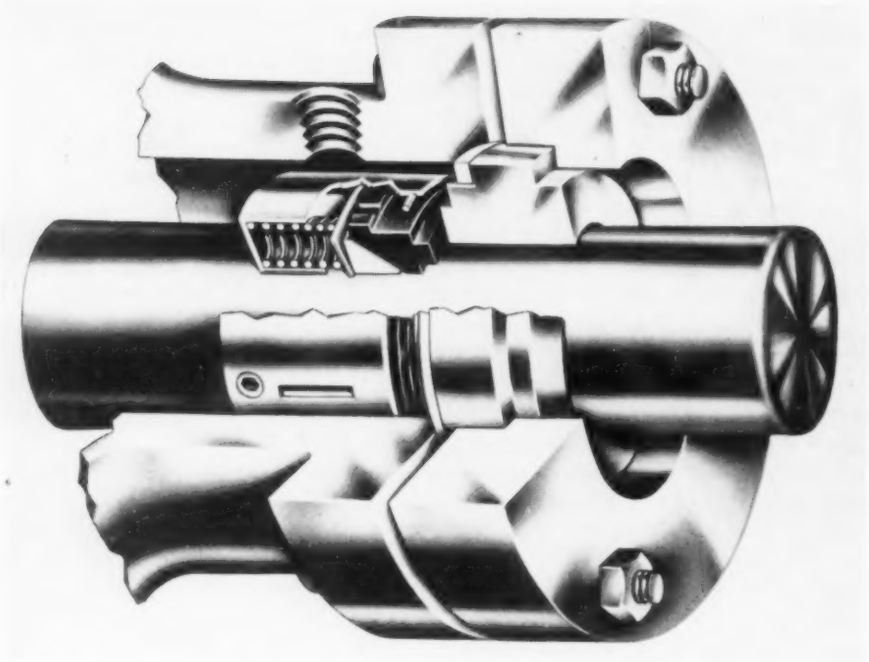


FIGURE 8—For temperatures greater than 212° F., the neoprene or buna bellows is replaced by a teflon wedge ring.

stuffing box is prevented by the mechanical seal on the left and leakage from the packing box to atmosphere is prevented by the mechanical seal on the right. Into the space between and surrounding these two seals is fed, at a pressure higher than the pumped liquid, a clear, lubricating liquid. The term lubricating does not necessarily refer to oil. It can be, and frequently is, water. In many instances this lubricating liquid performs the additional important function of cooling the seals below the temperature of the pumped liquid and thereby permits the use of a less expensive seal.

The double seals illustrated in Figure 6 use a neoprene or buna type of bellows which limits their use to a stuffing box temperature of approximately 212° F. This type used as a single seal, is further illustrated in Figure 7. It is a popular design for pressures up to 200 psig. With cooling, the actual pumped liquid could be considerably more than this. If the stuffing box temperature is going to exceed 212° F., the seals of Figure 6 would have to be replaced by two of a type similar to that shown in Figure 8 where the neoprene or buna is replaced by a teflon wedge ring which is recommended for a stuffing box temperature up to 490° F.

Seals for High Pressure. If the stuffing box temperature remains moderate but the pressure is increased beyond 200 psig., a modified balanced version may be used as shown by Figure 9. Its use does necessitate a stepped shaft or sleeve but it can be used up to 550 psig. The step is necessary to permit lowering the seal face diameters for a greater balancing of forces.

When the pressure exceeds 550 psig. but is under 1200 psig. and the temperature is under 250° F., the bellows construction of Figure 9 is not used; instead, a seal as shown by Figure 10 is used where the neoprene or buna bellows of Figure 9 is replaced by "O" rings. With this particular design the whole assembly is mounted on a sleeve which is secured to and by a collar on the shaft. The rotating elements of the seal are driven from the sleeve by keys.

It should be noted that it is the general practice of seal manufacturers to recommend the use of balanced mechanical seals on all light hydrocarbon applications, regardless of pressure, because of their volatile, easy flashing characteristics. Balanced seals are also recommended for high temperature oil, toxic liquids such as acid treated oils, phenol solutions and other chemicals.

Figure 10 shows a seal with the locking collar externally mounted, i.e. on the outside of the gland plate, where it is visible and accessible at all times. It could be conveniently de-

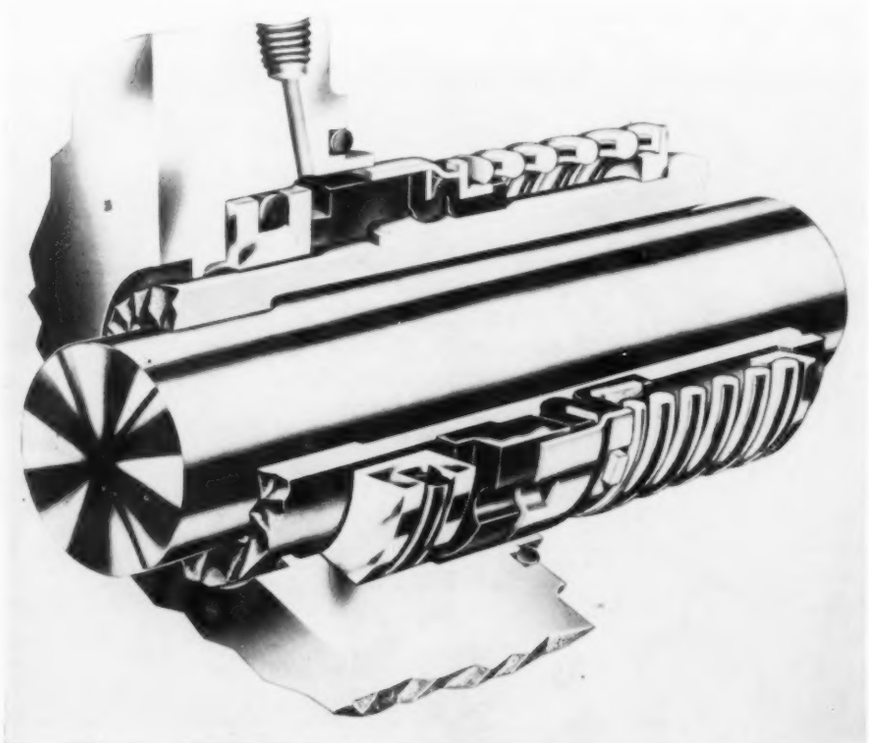


FIGURE 9—For pressures greater than 200 psig, a modified balanced seal is used.

signed to be at the other end of the sleeve; then, it would be an entirely internally mounted seal.

Sometimes, because of an unavailability of packing box space (usually in instances of conversion from packing to mechanical seals) the seal may be entirely externally mounted as shown by Figure 11. This arrangement is generally recommended only by necessity and for low speeds.

Figure 10 also shows a seal which is fitted with auxiliary packing. This arrangement is used where no inflammable, noxious or explosive fumes or vapors whatever can be allowed to escape to the surrounding atmosphere and is referred to as a smothering chamber or gland.

A pipe connection is shown to which a water supply may be connected for flushing away the leakage which has penetrated past the seal faces. Instead of the auxiliary packing a close fitting metallic bushing is often used.

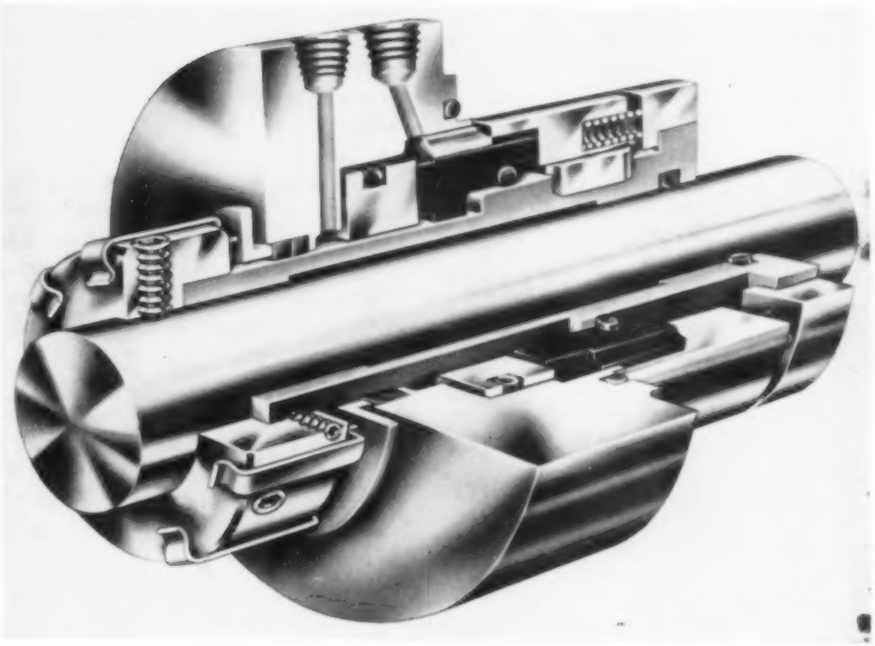


FIGURE 10—For pressures greater than 550 psig, bellows are replaced by "O" rings and a locking collar is externally mounted.

The auxiliary packing or bushing perform the dual functions of restricting, smothering or flushing liquid leakage and, in the event of complete failure of the mechanical seal, limit the leakage of dangerous vapors to atmosphere.

Care of Seals. The effectiveness of mechanical seals is entirely dependent on the fineness of finish of the seal faces which are lapped flat with extreme precision to a fine, smooth surface having a variation of only 23.2 millionths of an inch, or two light bands.

This extreme smoothness reduces the rubbing friction of the spring loaded rotating seal against the stationary seal face to the point where, with a minimum of lubrication, the seal can operate up to 5000 feet per minute rubbing speed. For the normal operating speed of 3500 revolutions per minute for a centrifugal pump, the limiting maximum seal face diameter is, then, $5\frac{15}{32}$ inches.

One must not overlook the fact in connection with mechanical seals, that, although they are an excellent and useful design, they can be a disappointment if improperly applied and handled.

The one all-important condition over which the seal manufacturer has no control, other than in the printed recommendations accompanying a new seal, is the care of handling seals in the field by customer's maintenance personnel. Details of this will be described in a later installment on maintenance of mechanical seals.

As previously mentioned, the seal faces are products of extreme precision. Now, the vast majority of commercial mechanical seals have rotating seal faces made of carbon, of the remainder most will not have dead hard faces. The result is that it is very easy, due to careless handling and an unawareness of the vulnerability of the seal face, to scratch it. The complete effectiveness of the seal is then destroyed and, in some instances, this can necessitate scrapping the seal. Mechanical seal manufacturers receive complaints about bad seals which are traced back as being entirely the fault of poor handling. In this respect mechanical seals can claim a close relationship to ball bearings in that they are both extremely susceptible to improper treatment in the installation period.

Fortunately, the pipe line industry maintenance personnel are the best trained, as a group, to be found anywhere, so that seal failures from poor handling are at a minimum, but, outside this area of operation, most early, unexplained failures are eventually traced back to defective handling, installation or maintenance.

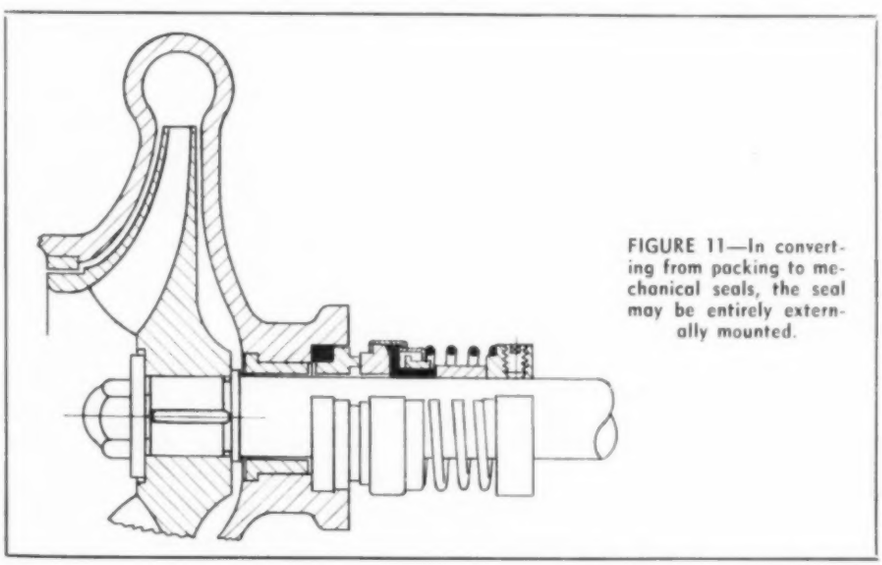


FIGURE 11—In converting from packing to mechanical seals, the seal may be entirely externally mounted.

Part 4 of this series will appear in the September issue of PIPE LINE INDUSTRY.

25 Ways to Ruin a Meeting

Check and see how many apply to you.

By J. DAMON QUINTON
Consulting Psychologist
Houston

THERE ARE many ways to make a pipe line staff meeting unsuccessful. Listed below are a few sure-fire "rules to ruin" for the meeting leader.

You may not have been as extreme in your actions as these indicate, but there may be some rules here that elicit guilt feelings. If so, your comment may be, "Well, I'm not *that* thoughtless, but . . ." So—check the ones that you have guilt feelings about and seek to correct *your* "rules to ruin."

1. Send Notices Two Months in Advance. This will allow the notice to be misplaced and forgotten. At starting time on the day of the conference, your secretary will have to call about half the participants. This will use up at least one hour of your time. Those who came on time get bored and restless. Latecomers are confused and apologetic.

2. Do Not Check Meeting Room. Especially if the meeting is to be held at a new location. More than likely the place will be uncomfortable, unpleasant and disagreeable. This will put a damper on discussion. You, the leader, will be under a strain. Perspiring, wiggling participants will add to your discomfort. A poor meeting place will convince the participants that the company lacks interest in the conference.

3. Be Late for Meeting. And have the only key to the conference room. Let the men stand around in the hall. That helps to ruin the conference. They will be grumbling, disgusted and in no mood to hold an enlightening discussion.

4. Let Group Arrange Own Chairs. This will guarantee a poorly arranged and scattered group. Most of the members will be lined up against the back wall. Friends will sit together in huddles and talk in loud stage whispers throughout the conference. That large, forbidding space between the leader and the participants will add to the downfall of the meeting.

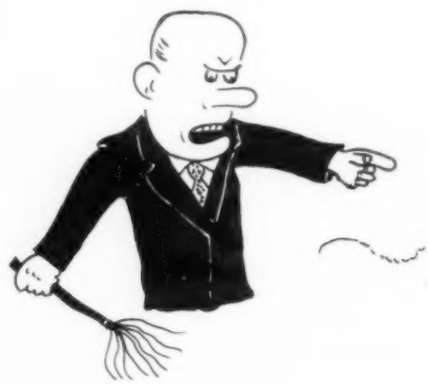
5. Do Not Control Temperature. You know that 68 degrees is the best temperature to have at a conference but darned if you're going to spend all your valuable time setting thermostats. Besides, if the temperature is high the men become sluggish and won't ask those embarrassing questions. "Let sleeping dogs lie" is a good motto here.

6. Don't Prepare Yourself. It is well known that most company meetings fail because the leader does not prepare himself. Don't bring prepared questions. Just "throw the meeting open." Everyone will just sit there in the awkward silence. Maybe everyone can get up and go fishing because your conference has had it, and you're off to a terrible start.

7. Be Ignorant of Topic. In this way the leader can illustrate to the group that he can consider no subjects that are not specifically covered in the leader's guide. To help this "rule to ruin" along, the leader can bluff his way through embarrassing questions. The result? Why, the leader will lose all the prestige he ever had. Not only will *this* meeting be ruined but future ones as well.

8. Introduce Subject in Long, Stilted and Biased Manner. By the time you finish this lecture type of introduction the participants will not understand the topic and will not know the problem to be solved. The

rest of the meeting time can then be spent with the blind leading the blind. A splendid disrespect for meetings can be built up in this manner.



9. Dominate the Group. The more the leader talks the less the participants talk. The members will begin to resent the leader's implication that he is the only one there with enough brains and experience to solve the problems. They feel useless and soon the session has turned into a "one man's opinion" affair.

10. Use Formal Language. This will create a stuffy atmosphere and dampen discussion. The participants will soon feel that the leader is "stuck up."

11. Alternative: Establish Informality Quickly. This can be accomplished by using profanity and telling dirty stories. You will find that you have succeeded in losing the respect of the group. Your meeting is now on the way to a howling failure.

12. Let a Few Members "Hog" Discussion. The best thinking of the group is not brought forth. If you do try to break this monopoly, do it di-

rectly. Administer a public rebuke. This will make the "hoggers" antagonistic or induce them to refrain from talking altogether. These people can create more confusion accidentally than you can intentionally. They are key people on your road to ruin. Encourage them.

13. Encourage Useless Debate. Guarantees to result in a "yes, it is" and "no, it isn't" discussion that uses up all the conference time and, more important, leads nowhere. Whatever you do, try to encourage the discussion so that the participants become highly emotional. The best planned company meeting can be broken up and ruined because everyone else learns only the prejudices and dogmatic ideas of the combatants.

14. Don't Draw Out the Reticent Member. If you do draw him out you may find that he has a great many fine ideas and can express them well. But this is apt to lead the meeting into productive channels. Soon the participants will be full of useful ideas for solving problems, making new products, etc. You will *never* ruin a conference in this manner. So watch your step.

15. Have Phone Calls of Members Transferred to the Conference Room. Best way known to ruin a meeting. Keeps party called from participating and interrupts the thoughts of everyone else. Personal calls from the conference leader's wife, or children, to pick up groceries show just how determined *he* is to ruin the meeting. Other members will develop an outstanding dislike for future conferences.

16. Answer All Questions Directed at You. Inject personal opinion heavily in discussions and answer all questions immediately. Referring the question to the group or redirecting the question to the questioner will only result in the group, collectively and as individuals, doing their own thinking. And don't label your opinions as such. State them as accurate facts. There is no need for a spirit of impartiality to prevail. If a group member wants to debate with you on a controversial point, do so. You can turn a meeting into a lively, stimulating cat and dog fight.

17. Be Blunt With Trouble Makers. To get a grouchy and negative member in a terrible mood, just tell him he's wrong when he blurts out his half-baked ideas. He will then become highly emotional and stubbornly defend all his remarks. A splendid feeling of resentment toward the leader develops. Don't let this trick you into using tact. Tactfulness is the prime requisite for a *successful* meeting. Let's have none of *that!*

18. Use No Humor. A good laugh aids a meeting. An amusing story interferes with heated arguments. A laugh tends to break down tension and relaxes the group. Easy discussion is encouraged. Great care must be used here or, before you know it, your conference is a success.

19. Ask Questions That Can Be Answered Only With "Yes" Or "No." This does not permit time consuming detailed answers. It will scotch all opportunity for participants to discuss the topic further by question, amplification, or disagreement. If you can't possibly ask the question in such a way as to elicit a "yes" or "no," then by all means use the leading question. This will put an end to bothersome thinking. The conference will develop into a "yes" and "no" social gathering, or into a debating society between the leader and his allies and the remaining participants.

20. Don't Use Charts or Blackboard. Charts tend to direct thinking. Besides, things that we see make a lasting impression on our minds. The participants are apt to remember vital points. Arranging ideas logically on a chart might stimulate the conferees to greater thinking. The horrible result? A lessening of the chance of forming wrong conclusions and forgetting important facts. In addition, the conferee will develop a sense of importance by seeing his contributions appear before the group.

21. Don't Become Familiar With Prepared Charts. Be surprised! Don't take undue advantage of the group by studying the charts beforehand. Just assume that everyone, including yourself, should understand each chart no matter how complicated it might appear. Just figure out what to say as you go along. To

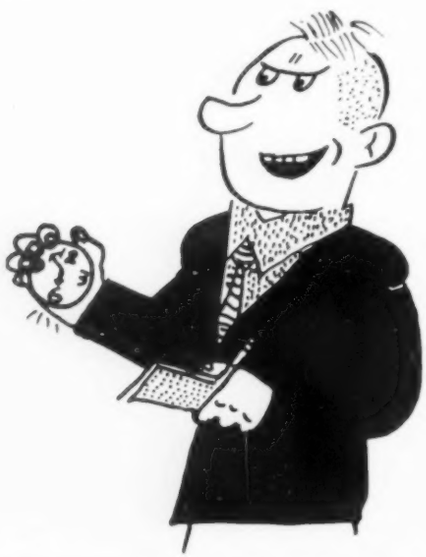
add to the confusion and ruin, keep these techniques in mind: (a) Let shadows or glare engulf the chart, (b) use any old scribble in preparing the words, (c) put a half-day's information on one chart, (d) stand in front of the charts when you use them, and (e) use long and unnecessary words.

22. Don't Use other Visual Aids. Such aids as movies, film-strips, flip charts, etc., will increase interest as much as 40 percent, make a subject 25 percent more understandable, reduce learning time by 25 percent and add to the amount of learning that will be remembered for a year approximately 36 percent. It is well known that people like these visual aids. No use pampering them. If you *have* to use a film get one that does not present ideas or principles for consideration. On the contrary, get one that is designed on the "here's how to do it" or "we know it all" basis. To keep the leadership work off your back, never use the film as an aid. Let it do the

entire teaching job. While the lights are out you can get in 40 winks.

23. Never Use Case Material. Meetings are queered from the start by using only theoretical discussions. Good, practical case studies might induce thinking, analysis, pro and con discussion, and genuine efforts to find a solution among a typical group of participants. If you do break down and use a case, use actual cases. Let everyone know the personalities involved. This will make individuals in the group or known to the group feel "framed" or "put on the spot."

24. Don't Summarize Main Points Before Closing. Increases chances of conference falling flat. If any good topics were discussed the participants won't remember them, can't apply any good suggestions. A good summary is apt to leave the participants with a feeling of accomplishment. An acknowledgment or review of the minority viewpoint, highlighting its merits, but indicating why it was rejected, will remove the minority members' feelings that there is a stigma attached to having been on the wrong side. But don't be tempted to do this. No summary will help kill the present meeting and stultify subsequent conferences.



25. Don't Close Meeting On Time. This is the clincher. Now everyone is mad. Rides and buses have been missed. It is too late for participants to call home and prepare the little wife. Dislike for meetings is built up. You, the leader, are a complete success. You have successfully ruined a company meeting. —**The End**

If Oil Could Speak

If oil could speak it would have many fascinating truths to tell the non-oil public—truths that would win thousands of new friends for the oil industry.

But, oil can't speak—you can. You, as an individual, can win many new friends for the oil industry if you will pass the true facts on to your non-oil industry friends.

Here are some of those true facts. They are being presented for one purpose: To keep you posted on your industry, so you can tell the story oil is unable to relate.

Read these facts. You will find them informative—and interesting.

"If Oil Could Speak" it would tell the American public:

- In terms of over-all energy requirements, oil and gas are meeting two-thirds of the nation's total needs. Natural gas and natural gas liquids provide 25.5 percent of the total requirements. Natural gas has virtually replaced manufactured gas in industrial and domestic heating.

- The oil industry invests an average of $23,000 to provide the tools and labor necessary to equip and supply each employe. This year, the oil industry will put more than $5 billion into capital expenditures.

- Consumption of oil by modern war machines is almost unbelievable. One of our newest airplanes burns in one hour as much fuel as the typical family auto in three years.

- Average cost of drilling a wildcat well is $90,000—and can range up to more than $1 million.

- Authorities have estimated that the nation's oil men must discover at least 70 billion barrels of new oil in the next 20 years. This is as much oil as they found from 1859 to 1950.

- Since the establishment of the U. S. Patent Office in 1836, about 3000 patents for processes designed to tap the vast quantities of petroleum in the nation's oil shale deposits have been granted.

- Maintaining and expanding the world petroleum industry in the next 10 years will require 115 billion dollars in capital expenditures—nearly twice the annual budget of the U. S. Of this sum, $73.5 billion will be spent within the U. S.

- Oil and gas production will generate more than half a billion dollars in U. S. income taxes this year, and over 250 million dollars in other federal, state, and local taxes.

- In 1954, farmers used more than one and one-third billion dollars' worth of gasoline and other petroleum products, an increase of 20.5 percent over 1950.

- More than 24 million households now use natural gas.

How 50 Oil Companies Train Employes

Here are the reasons why more than half of the larger oil companies are now using central sections.

By CARL MULLINS WHITE
Service Pipe Line Company
Tulsa

How CAN employe training best help meet today's critical shortages in efficient workers, leaders and scientists?

Many of the larger oil companies are concentrating their training efforts in a strong central section of highly qualified professionals.

More than half of the larger oil companies (employing more than 500) now have central training sections. About three out of every five who do not have such sections, express a desire to create them.

Over the past two and a half years, in cooperation with the University of Tulsa and representatives of the petroleum industry, we surveyed the training practices of large American oil companies.

The first phase of this research was a general investigation of training trends. Fifty of the largest oil companies—employing 452,611 people—were questioned. Each answered 535 questions, giving a total of 26,750 statistical items about their methods, subjects, equipment, instructors, and means of coordinating training.

Twenty-five companies reported having central training sections. Two others created theirs shortly after the report was compiled. The keen interest in centralized training uncovered by the first survey led to the second.

The second study was an investigation of how the 27 companies that have central training sections organize and operate them.

Here are the questions asked and the results of the findings:

How is a central training section organized and operated?

Central training sections vary in form from one company to another. The trends might be summarized as follows:

1. The training director is a staff member and ranks with about three other assistants to the personnel vice president or manager.

2. Two or three departments or sections in the company do not coordinate their training through the training section, but management hopes to effect hundred percent coordination at some future date.

3. Training is the responsibility of line management.

4. The training section performs a staff function, assisting line managers by:
   - **Advising**
   - **Assisting**
   - **Coordinating**
   - **Evaluating**
   - **Planning**
   - **Teaching**
   - **Testing**
   - **Training trainers**

5. Current efforts to train people in the art and science of instruction are extremely limited.

6. Significant progress is already made, but management hopes to improve the company's training facilities and strengthen its training section.

7. Training is struggling to become a profession.

Figure 1 (page 64) is the organization chart of an imaginary company. It shows exactly what is meant by "line" and "staff" and how training specialists would fit into a line and staff type of organization.

Each firm has its own means of trying to achieve a concerted training effort. These include:

- Regular reports of training activities submitted by branches or outlying locations.
- Plant or field visits by training people and general office executives.
- Year's plans and training budgets submitted for approval by central line executives.
- Periodic meetings of training people.
- Training projects in which field or plant personnel come to headquarters for training or training specialists travel to field locations.

In one company, supervisors originate all training by asking help of the training section. In another, the training staff takes the initiative. It trains the supervisors, maintains training records on them, plans and coordinates the training courses for the supervisors, actively assists the supervisors in their employe training and takes responsibility for supplies and equipment.

Generally, industry is trying to expand and improve its training facilities. To do so, it is widening the influence of its training sections.

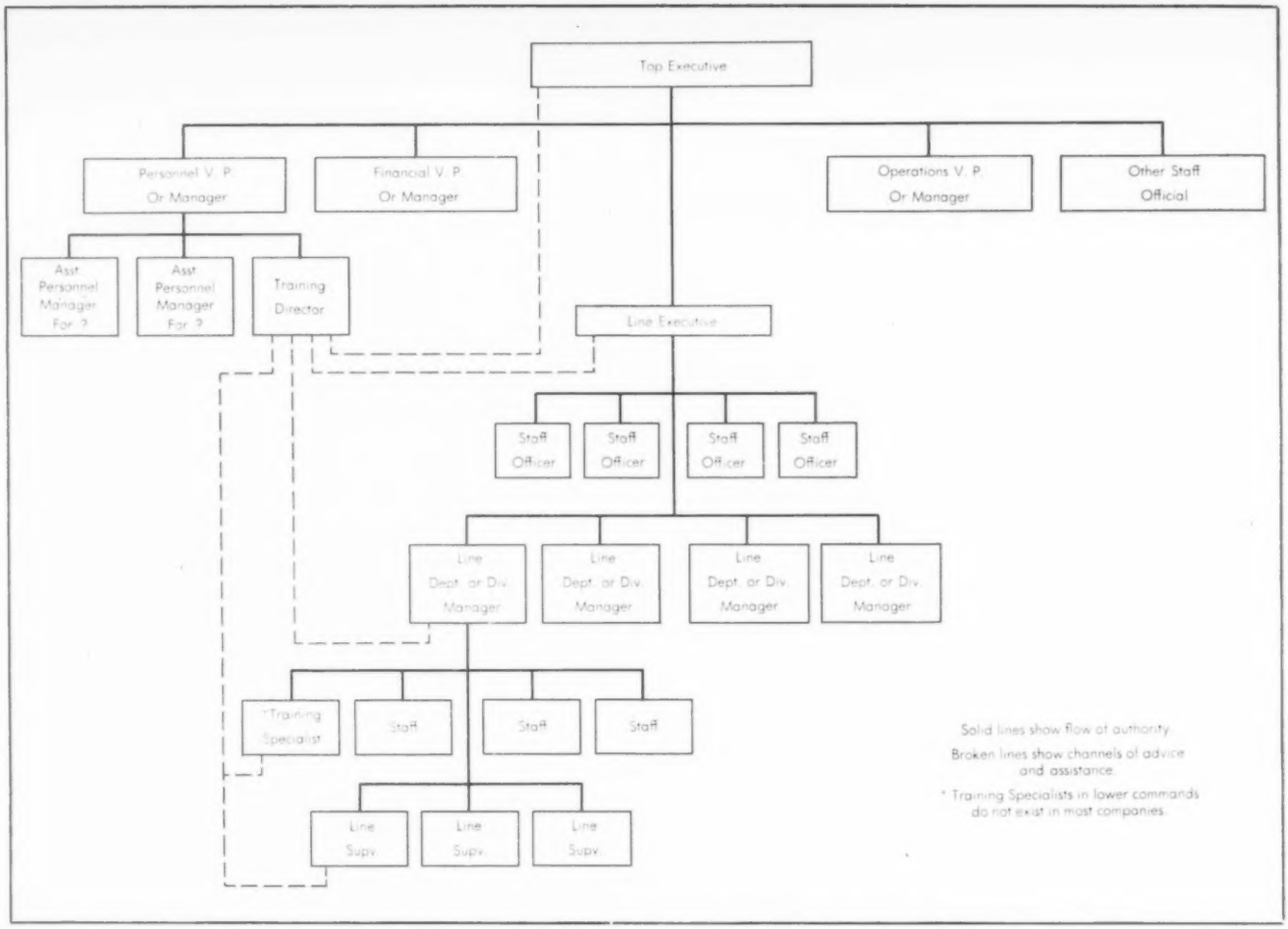


FIGURE 1—Suggested line and staff organization, showing where training personnel might fit in.

A central training section may operate in different ways, such as:

1. Courses taught by representative of the training section.
2. Training conferences organized and conducted by the training section, but in which much of the actual training is done by conferees.
3. Courses promoted, planned, and coordinated by the section, but in which a line supervisor or other local person does the actual teaching and conducting.
4. Courses (as in Job Know-How) handled chiefly by the local supervisor with help from the training section in materials, advice and other staff services.

There are many combinations and variations of the above avenues of attack. The enterprising company fits its plan to the problem.

The majority of companies still do not have any instructor development whatsoever. But nearly all express the intention to do something along this line in the future. One of the major trends of the next few years may well be more training for training.

Are Central Training Sections Paying Their Way?

The case for the central training section can be summarized by saying:

- Consolidation creates efficiency.
- The bigness of the training activity creates a need for able control.
- The complicated personnel problems of modern industry demand abler training specialists.

Consolidated Purchasing. In one sense, buying training is like buying materials. Through consolidating, a company can avoid duplications, assure more even distribution, and obtain better commodities at a saving. Companies having central training sections claim that they:

- Obtain better qualified training specialists.
- Avoid duplication of facilities such as classrooms, projectors, film strips, mechanical trainers and printed materials.
- Establish a common basis for:
  1. Maintaining emphasis on good training for all employes.
  2. Determining training needs throughout the company.
  3. Evaluating training results in all departments.

A training specialist, qualified in the techniques of instruction, can give valuable assistance to instructors regardless of the subject matter. A man with such educational background is not available for every job location. It is better to have one capable training specialist go from department to department than to have a number of unqualified people do training work without guidance.

Cradle to the Grave. Employe training is expanding in all dimensions, including its span of years.

One company has a popular program called "Science for Youth." Teen-age sons and daughters of em-

ployes meet at the plant to follow their various scientific interests. The company (D-X Sunray) furnishes instructors and laboratory equipment.

For many years industry has provided summer employment to college students as day laborers. Now the emphasis is less on the immediate work accomplished and more on training for possible employment after graduation. On-the-job training and university courses are fitted together in a meaningful pattern.

Many companies now train older employes for retirement. Their purposes are to make happier and more useful citizens of annuitants and to build goodwill.

So people are trained before employment begins and in preparation for life after employment ends.

Suppose we describe briefly the amount and variety of training activities in order to visualize the task faced by training directors.

For simplicity, the subject can be divided into five classifications.

1. Job Know-How
2. Human Relations
3. Safety
4. Policies and Procedures
5. General

Under these five headings are myriad courses. Some are: Basics of Supervision, Modern Management Practices, Basic Economics, Orientation, Counseling, Procedures, and Maintenance Techniques.

The extensive proportions of training activities constitute one of the training sections's gravest problems. It must:

1. Turn most of the actual teaching over to men who may know their jobs well but cannot impart their own enthusiasm and skills to others.
2. Attempt to do all the teaching—which it cannot do.
3. Teach others to teach.
4. Do some of the teaching and develop instructors for the rest.

Wanted, Social Scientists. The training specialist needs a strong academic background. Whether gained in university or through private study, he should have extensive knowledge of training methods, psychology, and other social sciences. This demand for higher professional standards is born of industry's need for skilled employes and able leaders. These have to be discovered and developed. The discoverer-developer ought to be a dedicated student of human behavior.

During World War II, brilliant men developed serious neurosis because their sergeants were incapable of understanding and making use of the best that was in them. Sometimes the sergeant was the less intelligent of the two. By transferring them to more challenging work, the men, and their countries, were given the gift of a useful life.

Likewise, executives are taking a second look at their own file clerks and section heads, foremen and laborers. Boring through the shale of supervisors' limitations, they give talent a chance to flow. Here lie rich sands of opportunity for the specialist in human resources.

About the Author

CARL M. WHITE is a training specialist who has had an almost lifelong interest in the many phases of training. He received his B.S. degree in business administration from Northwestern University and his M.S. degree in industrial psychology from the University of Tulsa. He is an educational advisor to the Air Force Reserve, and is continually promoting expansion and improvement of training facilities within his own company, Service Pipe Line Co. During the past three years he has been conducting a research program on the training practices of the petroleum industry. This has been done with the cooperation of the Psychology department of the University of Tulsa, the Industrial Society, and representatives of 50 large oil companies.

Management's Dilemma. Supervisors and executives not only need training for themselves. They rely on it as a management aid. Pressed between technological demands on one side and human limitations on the other, the supervisor looks about him for ways of increasing individual effectiveness. One means is to sharpen his teaching ability.

The supervisor's dilemma has led management to realize the need to train for training. To teach men the art and science of instructing others can be done by only those specially educated for it.

Business requires a higher calibre of management today than ever before. The old types of leadership are not adequate: Too much depends on too many, too far away. There are deals and decisions that cannot be covered by printed manuals. The remote supervisor in the far flung reaches of a large company needs a built-in communication system tuned loyally to the interests of management and sensitively to the needs of all his employes.

The good supervisor or executive:

1. Knows his job.
2. Understands the human-social-industrial community within his company.
3. Imparts skill and knowledge to others.

These abilities can be enhanced through training. But this brand of uplift is the task of an educator.

What Companies Are Doing. To meet these increasing demands, many companies are:

1. Turning to the central training section as an agency that can devote its full time to training and divide its interest impartially between all employes.
2. Expanding their training sections to coordinate the training of all departments.
3. Employing training specialists with broad professional backgrounds in training methods, psychology and other social sciences.

The trend toward centralization has appeared good. All companies that created training sections reported that they were pleased.

But the task cannot be left to the tool. And the human task grows and changes. —The End

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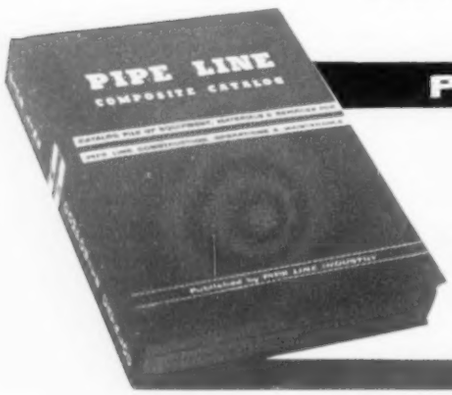

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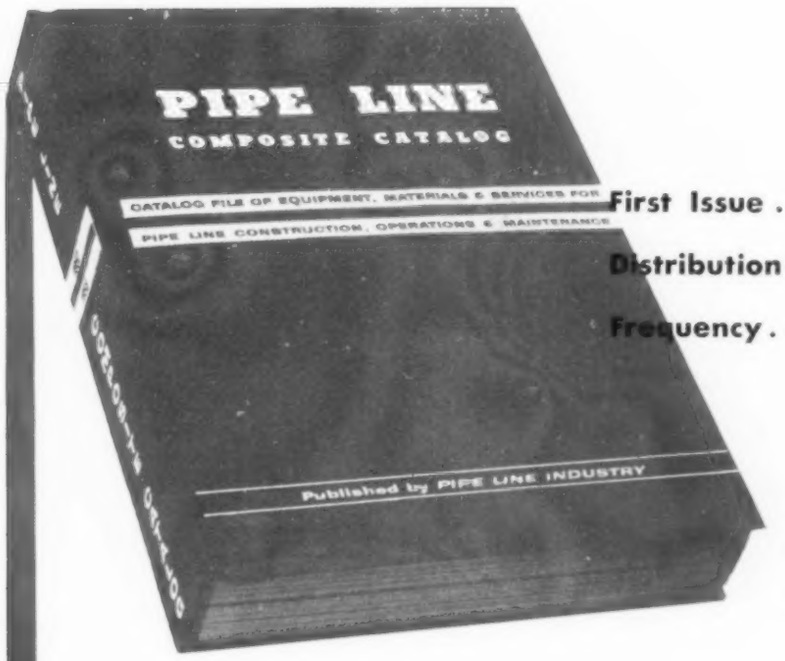
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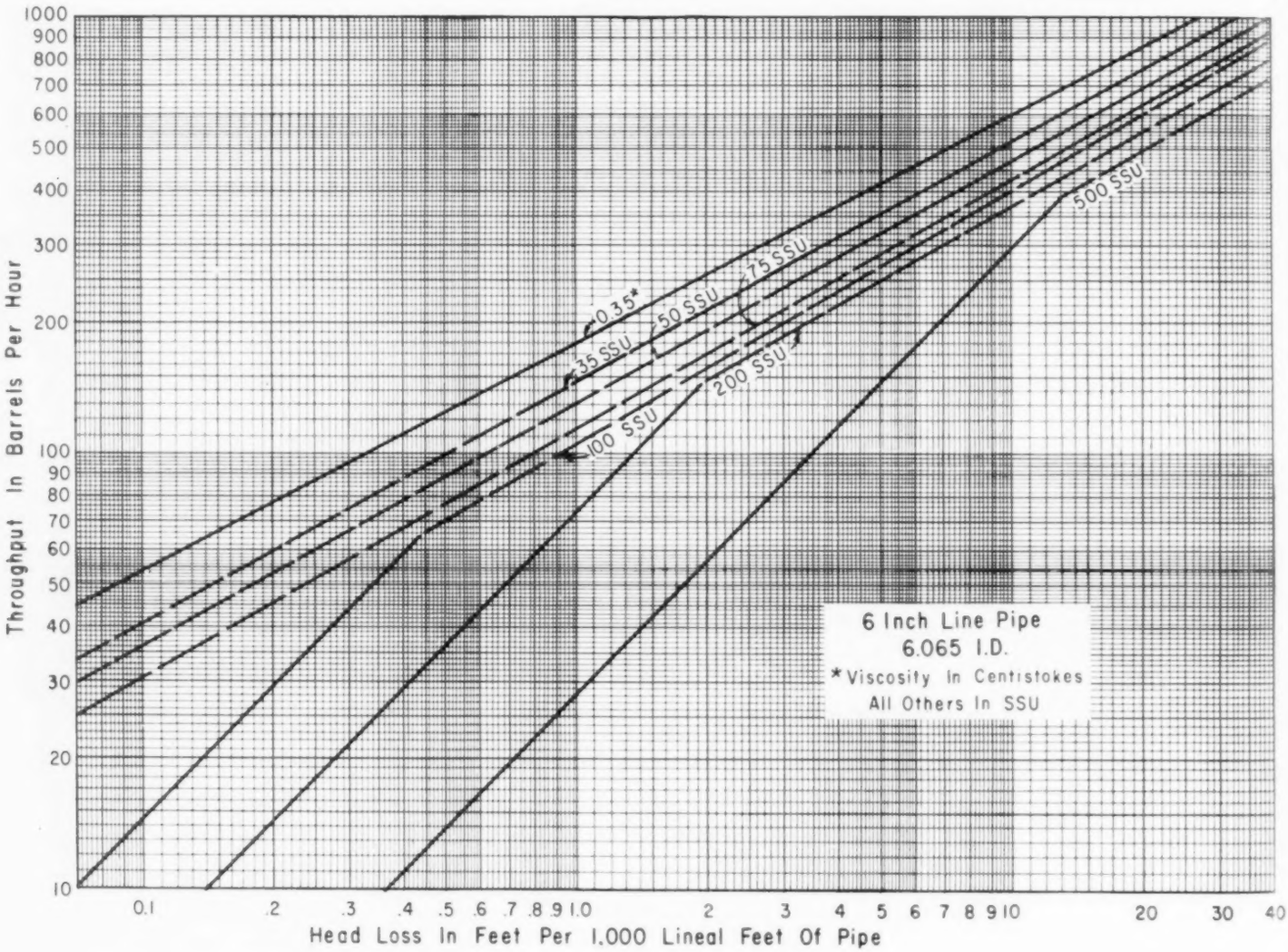

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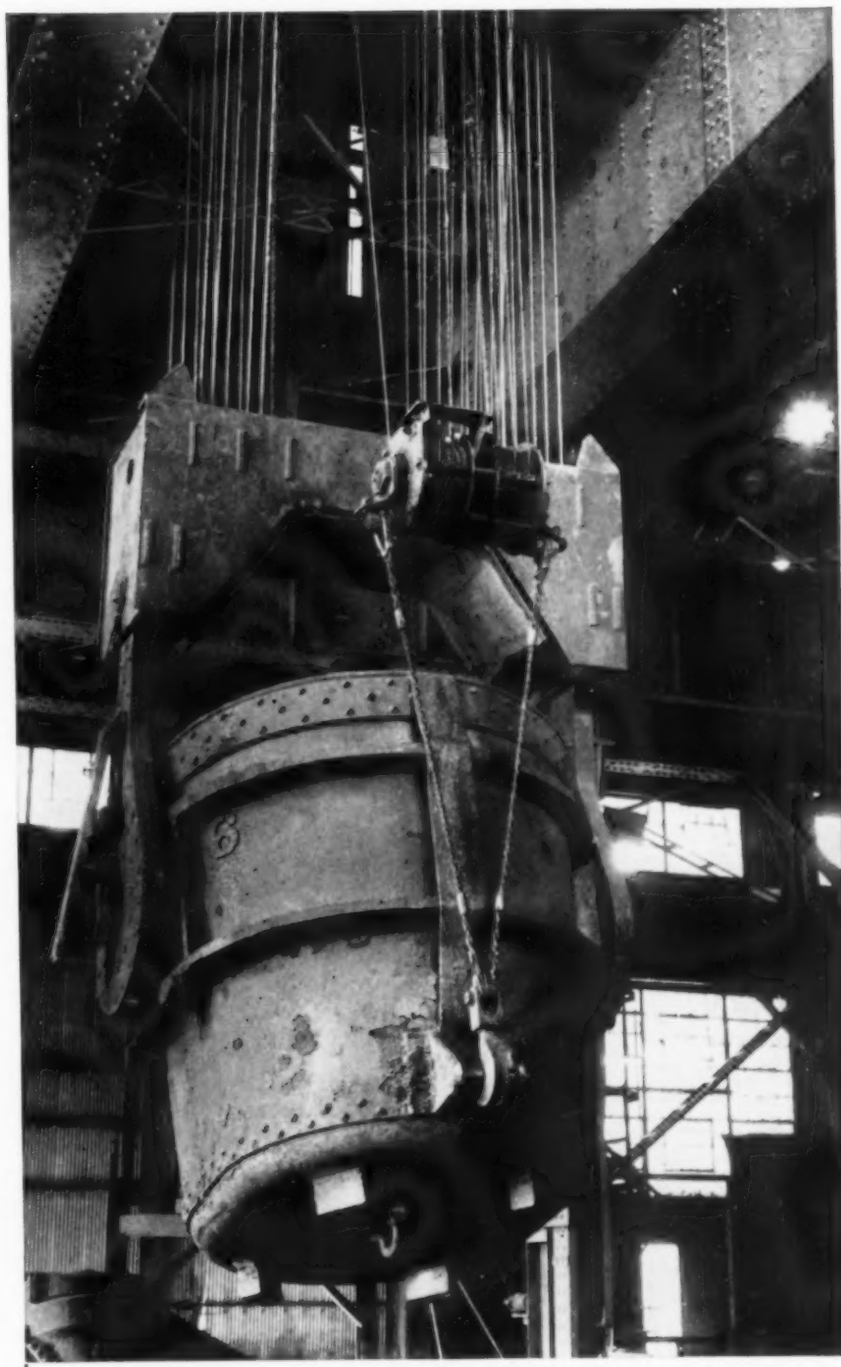

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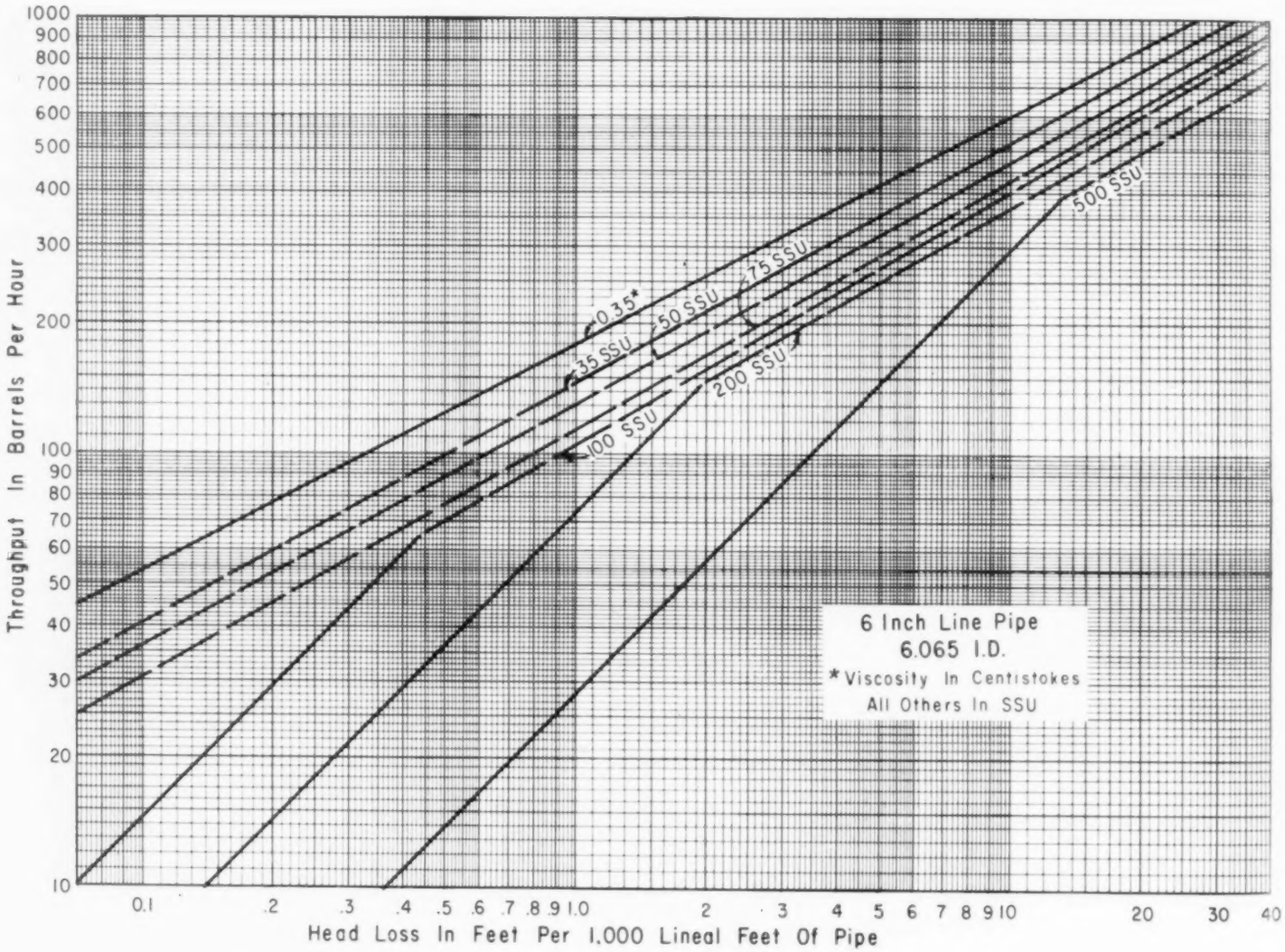

Engineering Design —32—Head Loss Charts for Various Sizes of Pipe

Friction loss characteristics were computed by a pipe line company based on engineering experience and Hydraulic Institute data. Use of this data in laminar and critical zones is adequate for estimates. Friction losses in Transition and Complete Turbulence Zones are very accurate in flow predictions.

Tuffy Slings Give Steel Mill Twice the Service of Ordinary Slings

"We are getting twice the service life from our 1¼-inch Tuffy Slings as we did from 6x37 type slings."

This testimonial from a giant steel corporation says more for the quality and dependability of Tuffy Slings than we could tell you in any other way!

The secret of Tuffy's longer life is Tuffy's exclusive, patented, braided construction. This machine-braided fabric combines super strength with extra flexibility.

It's Almost Impossible to Kink a Tuffy Sling. Try It!

Even if you succeed in kinking a Tuffy Sling with the help of a vise, you can straighten it out with no material damage to the fabric. Tuffy's resistance to knotting, kinking and looping is just one reason why Tuffy Slings can give you double the service of ordinary slings. Now let's take a look at the Tuffy ferrule:

Tuffy Pressed-On Ferrule Gives 100% of Fabric Strength

Applied under tremendous pressure, the steel ferrule literally flows into every space between the wires and strands. The friction force created gives the eye splice full strength of the sling fabric.

Your Tuffy Distributor is Stocked to Meet Your Needs

He's ready with your Tuffy Slings and Union Wire Rope needs. Get in touch with him now!

Get Your FREE Tuffy Sling Handbook

Gives full data on Tuffy Sling types, dimensions, weights and rated loads. Plus a complete rigger's manual and engineer's notebook on wire rope constructions and specifications. Write for copy now!

HOT and HEAVY — this huge ladle is "handled with care" by a 1¼" Tuffy Sling and two 1⅛" Tuffy Hoist Lines. The load is 125 tons of molten steel being poured into the furnace.

union Wire Rope corp.

Specialists in high-carbon wire, wire rope, braided wire fabric, and stress-relieved wire and strand. (4)

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For more data on advertised products, use Readers' Service Cards, last page.

Route of the proposed Alberta-San Francisco line.

Pacific Gas & Electric Company Plans Gas Line from Alberta to San Francisco

Another gas line from western Canada into the United States is in the making. Pacific Gas and Electric Company plans to construct a major gas transmission line from Alberta to the San Francisco area.

The $330 million proposed pipe line project forecasts a delivery of 400-million cubic feet a day by 1960.

The Canadian gas would augment PG&E's present supply from California fields, the Four Corners area and Texas. The latter two areas now provide about two-thirds of the company's daily gas resources and an even greater amount of gas would continue to be bought from them.

PG&E may be joined by other California companies in the interstate and international venture. Southern California Gas Company and Southern Counties Gas Company, subsidiaries of Pacific Lighting Corporation, now share with PG&E the gas delivered by El Paso to the California border.

These companies have been offered 50 percent of the deliveries from Canada.

A recently-organized Canadian subsidiary of PG&E, Alberta & Southern Transmission Company, has purchased a substantial quantity of gas for the project and is continuing negotiations.

The proposed pipe line will stretch 1300 miles from these gas reserves in Alberta to the San Francisco Bay area. The line will cross several mountain ranges including the Canadian Rockies. It will traverse portions of British Columbia, Idaho, Washington, Oregon and Northern California, terminating at an existing PG&E transmission network station at Antioch.

Approximately 550,000 tons of large diameter steel pipe will be required. Bechtel Corporation will assist PG&E in the design, engineering and construction.

The project will require authorization of governmental agencies of Alberta and Canada, the Federal Power Commission and the California Public Utilities Commission.

Venezuela's Three New Crude Lines Will Provide Outlets for Four Fields

One new crude pipe line has been finished and two more are now under construction in Venezuela.

The 20-inch, 212-mile crude line to connect the Barinas Basin of interior Venezuela with terminal facilities being constructed at Punta Chavez near Puerto Cabello is expected to be finished and in operation by late September or early October.

Williams Brothers of Tulsa is the contractor. Socony Mobil Oil Company of Venezuela has a 75 percent equity in the $26 million project and Sinclair Oil and Refining Company has 25 percent.

The line will give two oil fields an outlet for production. It will be fed from gathering lines in the Sinco field and the San Silvestre field, both in Barinas state.

Pipe for the line has been laid and crews are making tie-ins, testing, and finishing civil engineering work such as bridges and crossings. Three centrfugal pumps, storage tanks and a causeway extended by an adjoining pier for loading purposes are included in the project.

Elsewhere in Venezuela, Creole Petroleum Corporation will build a 90-mile, 30-inch crude pipe line in eastern Venezuela to provide an outlet for the viscous crudes of Temblador field. The line will extend from El Pilon via Maturin to Caripito. Contracts were let to Pipe Line Engineering Co. and Oklahoma Pipe Line Constructors. Pipe will be delivered the last quarter of 1957 and construction will start the first of next year.

Also in eastern Venezuela, a 32-mile, 8-inch pipe line has been opened to move crude from Aguasay field to Puerto La Cruz. The new line links the deep producing field with the 16-inch Amana line which moves crude for three companies from the Santa Barbara area to the port. The Venezuelan Petroleum Company owns the new line.

Muskegon Pipe Line Contract Awarded

Midwestern Constructors, Inc., Tulsa, has been awarded the contract to build a 165-mile crude oil pipe line for the Muskegon Pipe Line Corporation. The 10-inch line from Griffith, Ind. to Muskegon, Mich. will connect the Aurora Gasoline Company and the Naph-Sol Refining Company refineries in Muskegon with the Service Pipe Line Company system at Griffith.

Service and Aurora are joint owners of Muskegon Pipe Line Corporation. Service will build and operate the line which is to be completed late this year. It will move three types of crude without intermingling.

245 hours less greasing time...
245 hours more profit time EVERY YEAR!

Time saved by 1,000-hour lubrication intervals on your Allis-Chalmers tractor adds up to 245 hours every year—an extra month of production!

On truck wheels, support rollers and idlers, an exclusive combination of positive, spring-loaded seals and tapered roller bearings keeps out dirt and moisture, prevents loss of lubricant.

For 1,000 tractor work hours, you can forget about every grease point below track level. When it's time for servicing, simple low-pressure flush lubrication replaces old grease completely, eliminates seal popping, prevents damage to seal faces. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

IT'S SIMPLE ARITHMETIC!

	Other Tractors	Allis-Chalmers Tractors
No. of greasings per year (5,000 hr)	up to 500	5
Greasing time (av. conditions)	½ hr	1 hr
Time spent greasing	up to 250 hr	5 hr
PRODUCTION TIME GAINED . . . 245 HOURS EVERY YEAR!		

ALLIS-CHALMERS

Engineering in Action

Southern Natural Receives FPC Approval For Louisiana Coastal Line Construction

The Federal Power Commission has authorized Southern Natural Gas Company to construct pipe line facilities connecting its transmission system to additional natural gas reserves in three Louisiana coastal parishes.

At the same time, the Commission granted certificates to five independent producers authorizing them to sell the gas to Southern. They are Tidewater Oil Company, Gulf Oil Corporation, Kerr-McGee Oil Industries, Inc., Phillips Petroleum Company and Magnolia Petroleum Company.

The ten fields are located in Plaquemines, St. Bernard and Jefferson Parishes and the adjoining offshore areas. The facilities, estimated to cost $7.6 million, include about 60 miles of pipe line, 7260 horsepower in compressor capacity and meter and regulating stations.

The FPC also authorized Southern to make changes in a pipe line construction project authorized last March. The changes will provide the necessary capacity to handle the increased volume of gas produced in the southern Louisiana area.

Less Breakage at Low Temperatures
COSTS LESS ON THE PIPE
Less Breakage Near Roll Core
Less Breakage From Quick Starts
Normal Curves At Straight-line Tension

PERRAULT 15 lb. FELT Glass Fibre Reinforced

also...

Glass, Asbestos and Kraft Wrap . . . Rock Shield . . . Coating & Wrapping, Cleaning & Priming Machines . . . Tar Kettles, Patch Pots, Burners & Accessories . . . Pneumatic Inside Line-up Clamp . . . Pneumatic-tired Lowering-in Cradle . . . Pipe Cradles . . . Tongs, Sling Belts, Hooks, Clamps, Hand Tools, Supplies and Equipment of Every Sort.

Perrault fifteen-pound asbestos pipe wrap is reinforced with longitudinal glass fiber strands at one-fourth inch spacing. It costs no more delivered to the job, but by eliminating most shut-downs due to breakage, it costs far less on the pipe. Since it is not brittle when cold. Perrault reinforced felt is especially recommended for Fall and Spring Projects where material will be kept in unheated storage. Let us show you a sample and quote your next job. We also offer the best in other pipe wraps: Owens-Corning Glass, Kerr-McGee Outer Wrap, Kraft, and the original Rock Shield.

PERRAULT EQUIPMENT COMPANY

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Little Inch Work Advances As Barge Interests Argue

A petition has been filed with the Federal Power Commission asking for re-opening of hearings concerning the authorized Little Inch reconversion to a products line. Barge operators, Chotin Towing and other Mississippi River barge interests, have prepared a brief pointing out that with Texas Eastern's plans to purchase La Gloria Oil & Gas Company, the Little Inch line could become a shipper-owned products line. According to Chotin's brief, this would be contrary to previous testimony by Texas Eastern saying the line would be an independently owned common carrier.

A report from Texas Eastern forecasts ready operation for the reconverted products line by the end of this month. Building of substitute gas facilities has progressed so that physical separation of the Little Inch from the gas system will occur this month. About the same time, the company will begin receiving products into its tanks in preparation for September's initial pumping.

Trans-Western Company Plans Four Corners-California Line

Trans-Western Pipe Line Company has been organized to build a gas line from the Four Corners area to the expanding California market.

The new company was organized by Warren Petroleum Corporation, Monterey Oil Company and J. B. Butler, Houston consulting engineer. John R. McMilan, Trans-Western's president, estimated the project is about a year away from construction.

The project hopes for 2 trillion cubic feet in reserves and an initial volume of 200,000,000 cubic feet per day. Some of the reserves have been signed up in the Colorado, New Mexico, Arizona and Utah area.

LUBRICATE PLUG VALVES

in seconds— instead of minutes

with this timesaving combination

Yes, seconds are all it takes to lubricate plug valves, today. You'll eliminate waste, and save time and effort with this combination: Walworth High Pressure Lubricant Gun, Walworth Button-Head Fittings, and Walworth Jumbo Size Lubricant Sticks. They'll pay for themselves quickly and are adaptable to most of the lubricated plug valves that are in use today.

Walworth High Pressure Lubricant Gun. This is the only gun available today that satisfactorily handles the stick form, full-bodied lubricants needed for proper lubrication and sealing of plug valves. Easy to operate; two Jumbo Size Lubricant Sticks fill the barrel.

Walworth Button-Head Lubricant Fittings. Use them as lubricant fittings or as regular lubricant screws with standard size lubricant sticks. Just slip hose coupling onto fitting for a leakproof connection.

Walworth Jumbo Size Lubricant Sticks. Individually wrapped and packed ten to the box; clean and easy to handle . . . eliminate messy loading. Types available for most line fluids. Always use Walworth Lubricants in Walworth Lubricated Plug Valves.

Start saving today . . . call your nearby Walworth Distributor. He'll be glad to supply Walworth High Pressure Lubricant Guns, Button-Head Fittings, and the right Jumbo Size Lubricant Sticks for any lubricated plug valve service condition.

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DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Texas Eastern Offers Stock Exchange For Purchase of La Gloria Oil & Gas

If La Gloria stockholders and the Securities Exchange Commission approve the $70-million stock transaction proposal, Texas Eastern Transmission Corporation will acquire La Gloria Oil & Gas Company of Corpus Christi.

Texas Eastern's directors voted to offer La Gloria stockholders one share of its common stock for each 1-million shares of La Gloria capital stock. It is now up to La Gloria's stockholders to approve. No hitch is expected.

Texas Eastern would operate La Gloria as a subsidiary. The company is primarily a producer of oil and gas including interest in 526 producing wells that averaged a daily 7000 barrels of crude and 80-million cubic feet of natural gas last year. Other assets include a refinery, natural gas processing plant and interest in a petrochemical plant, all in Texas.

C-R-C
KELLEY RIPPER

The C-R-C Kelley Ripper, D-9 Caterpiller size, rips 6' deep through laminated rock ahead of the ditching machine, with savings in time and cost per ditch. Hydraulic or cable-operated C-R-C Kelley Rippers are available also in sizes to fit D-8 and D-7 class tractors. Write or call Crutcher-Rolfs-Cummings, Inc., at 7825 Katy Road, Houston, Texas, UNderwood 4-6391.

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7310 99th St., Edmonton, Alberta, Canada

For additional information see page 107, Pipe Line Composite Catalog.

Edjele Field Developers Plan Algerian-Libyan Line

A new Algerian-Libyan crude line to carry oil from the promising Edjele field in southeastern Algeria to a Mediterranean port on the Libyan coast is in the final planning stage. According to reports, orders have been placed with a French firm for 450 miles of 16-inch pipe.

The line will be constructed by Cie de Recherche et d'Exploration de Petrole au Sahara, discoverers and developers of the Edjele field. The initial capacity is expected to be 100,000 barrels daily. The decision to terminate the line in Libya indicates that it will be considerably shorter than an all-Algerian line proposed earlier.

Announcement of the line did not mention any planned connection with production developed at Hassi Messaoud, almost 400 miles northwest of Edjele. The French had mentioned earlier a plan to connect this field with a small-diameter line to railheads at Biskra or Laghouat.

Maps Show U. S., Canada Products and LPG Lines

A new map showing products and L.P.G. pipe lines of the United States and Canada is now available from E. C. Jacobson, Maps, 315 Mayo Building in Tulsa, Okla. The map, No. 27, gives pipe sizes, proposed lines, products delivery terminals, refineries with capacity barrels crude oil per day and principal cities and towns.

Two additional maps are available. No. 25 outlines crude oil and gasoline pipe lines of the United States and Canada and No. 26 shows the natural gas lines of the same territory.

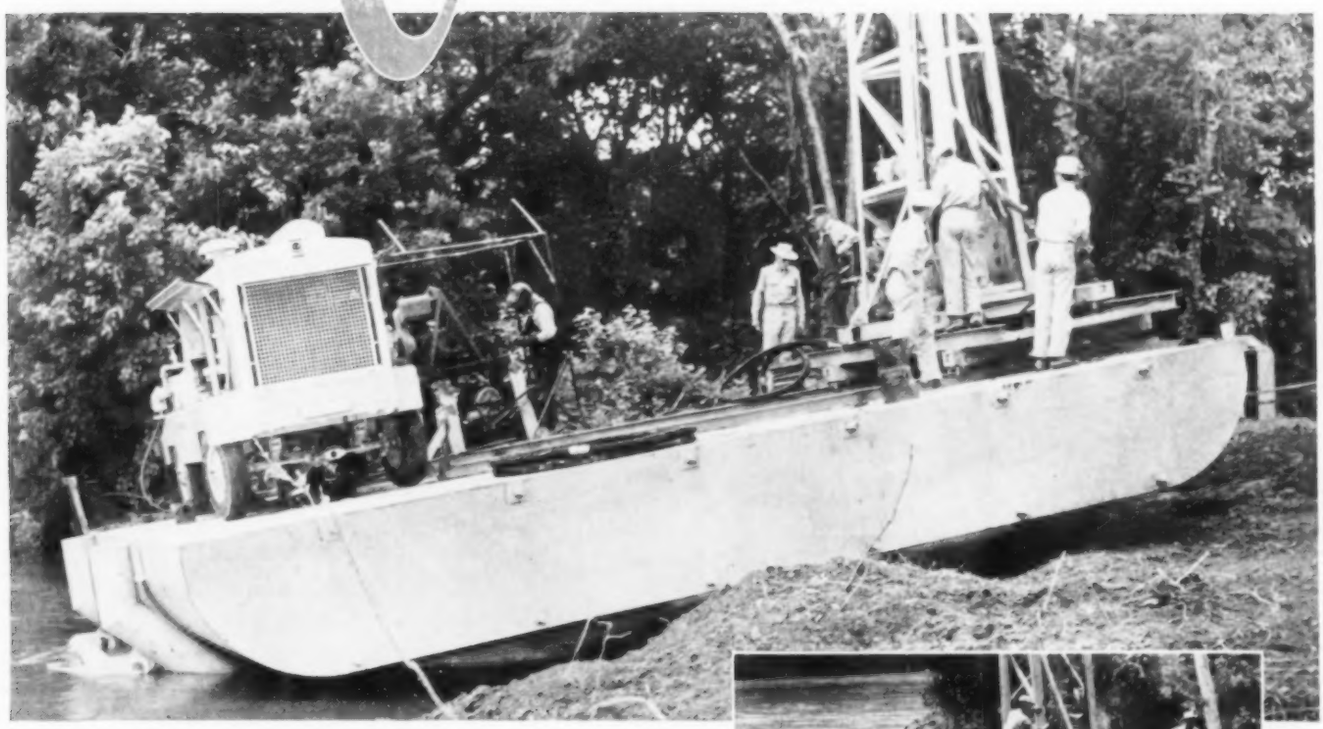
First Gas Technology Course Offered in Canadian School

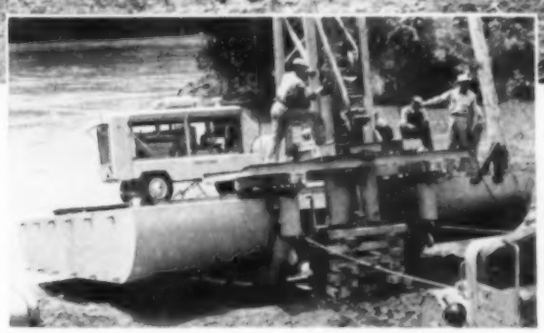
A three-year course in gas technology is being introduced into the curriculum of the Ryerson Institute of Technology in September. The course is the first of its kind to be made available in Canada and will cover a wide range of subjects such as engineering drawing, pipeline design, instrumentation and control, combustion principles, gas utilization, corrosion control, welding, metallurgy and gas analysis.

30" PIPELINE CROSSES POTOMAC

with the aid of a drill-barge-mounted

GYRO-FLO PORTABLE





Unique submarine drill barge, built by Associated Pipe Line Contractors, Inc., is powered by a standard Ingersoll-Rand 600 cfm Gyro-Flo portable compressor

Associated Pipe Line Contractors, Inc., recently completed laying a 30" line across the Potomac River near Rockville, Md. The river at this point was 2800 feet wide with a bed of solid rock.

This difficult rock drilling problem was solved by using the all-steel drill barge shown above, built by Associated. On it are mounted an Ingersoll-Rand SD-65 Submarine Drill which is powered by a 600 cfm Gyro-Flo portable air compressor. The Gyro-Flo is anchored aboard without removing the running gear, thus leaving it available for on-land drilling work.

This river crossing is a part of Associated's 80 mile section of Transcontinental Pipe Line Corporation's main line looping program from Texas to New York. The Gyro-Flo mounted on the barge was only one of a number used on this project, and these compressors, together with other Ingersoll-Rand rock drilling equipment gave their traditional trouble-free performance.

Wherever contractors need dependable, low-cost air power, they agree that "there's only *one* Gyro-Flo". Ask your Ingersoll-Rand representative to give you the complete story.

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AN UNBEATABLE COMBINATION . . . GYRO-FLO COMPRESSORS AND I-R ROCK DRILLS

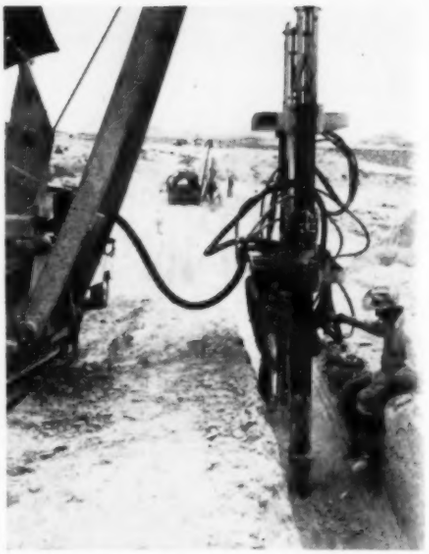
Natural Gas Pipeline Company Lets Remaining Sections of Panhandle Line

Natural Gas Pipeline Company of America has recently let contracts for the remaining sections of its 350-mile line from Bridgeport, Texas to Fritch, Texas in the Panhandle.

River Construction Corporation will be in charge of two spreads totaling 173 miles from Mountain View, Okla. to Fritch. Work on these sections will start this month.

H. B. Zachry Company will construct the remaining 87 miles of 26-inch line which is located between Healdton, Okla. and Mountain View. Eastern Pipeline Contractors are already at work on a 90-mile, 20-inch section from the southern terminus at Bridgeport, Tex. to Healdton.

The line will be completed by January with a daily capacity of 240,000,000 cubic feet into Natural's main line at Fritch.



Ditching With Explosives

Four Corners Pipe Line workmen are making ditch at a fast pace. This picture taken on the Navajo Reservation of southeastern Utah shows one of their obstacles—stretches of rock which had to be drilled and blasted to reach five-foot depths for the ditch. Pneumatic drills on side-boom tractors punch holes for the explosive charges. The line will carry crude to refineries near Los Angeles.

Bechtel Ltd. Gets Contract For Union Gas' Ontario Line

The Union Gas Company of Canada, Ltd. plans to have in operation by next winter a 26-inch gas pipe line carrying additional natural gas into southwestern Ontario.

Canadian Bechtel Limited has the contract for construction of the 141-mile line and expects to place two spreads on a stepped-up schedule by the first of next month. Completion date is in November.

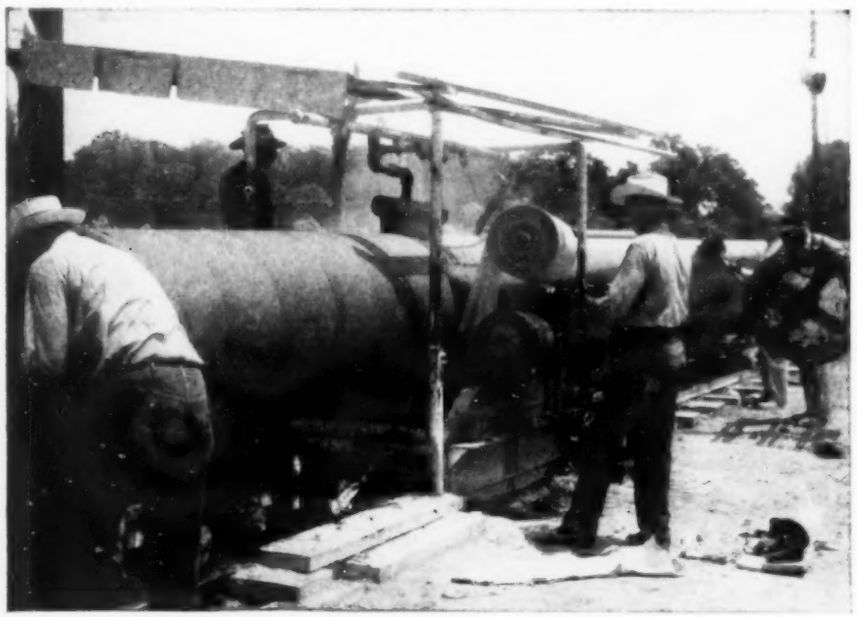
The line will extend from the Union Gas underground storage fields south of Sarnia to a point near Sheridan, northeast of Oakville.

Everglades Pipe Line Makes Final Plans for Products Line

Cities Service Company and Buckeye Pipe Line Company, principal owners of the recently formed Everglades Pipe Line Company, have completed plans for a $4 million Florida products line.

Everglades Pipe Line Company will build the 60-mile common carrier products pipe line from terminals at Port Everglades, Fla. south to the Miami area.

Buckeye will build and operate the line.



Lay Pipelines Faster with

RUBEROID LIGHTWEIGHT IMPERIAL

Glass Fiber Reinforced Asbestos Pipeline Felt

Ruberoid's new Lightweight Imperial Pipeline Felt—reinforced with glass threads—is thinner, lighter, easier to handle. With more felt coverage per roll there are fewer machine stoppages for loading. Lightweight Imperial means a faster job from start to finish.

Because of the tough but light glass threads that are added to it, Lightweight Imperial has a greater tensile strength per pound than ordinary felt. And most important of all it's lower in cost.

For extra savings in wrapping pipelines, investigate the lower cost, easier handling, greater strength and faster application of Ruberoid Lightweight Imperial Glass Fiber Reinforced Asbestos Pipeline Felt.

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"Serving All Pipelines"

The RUBEROID Co.

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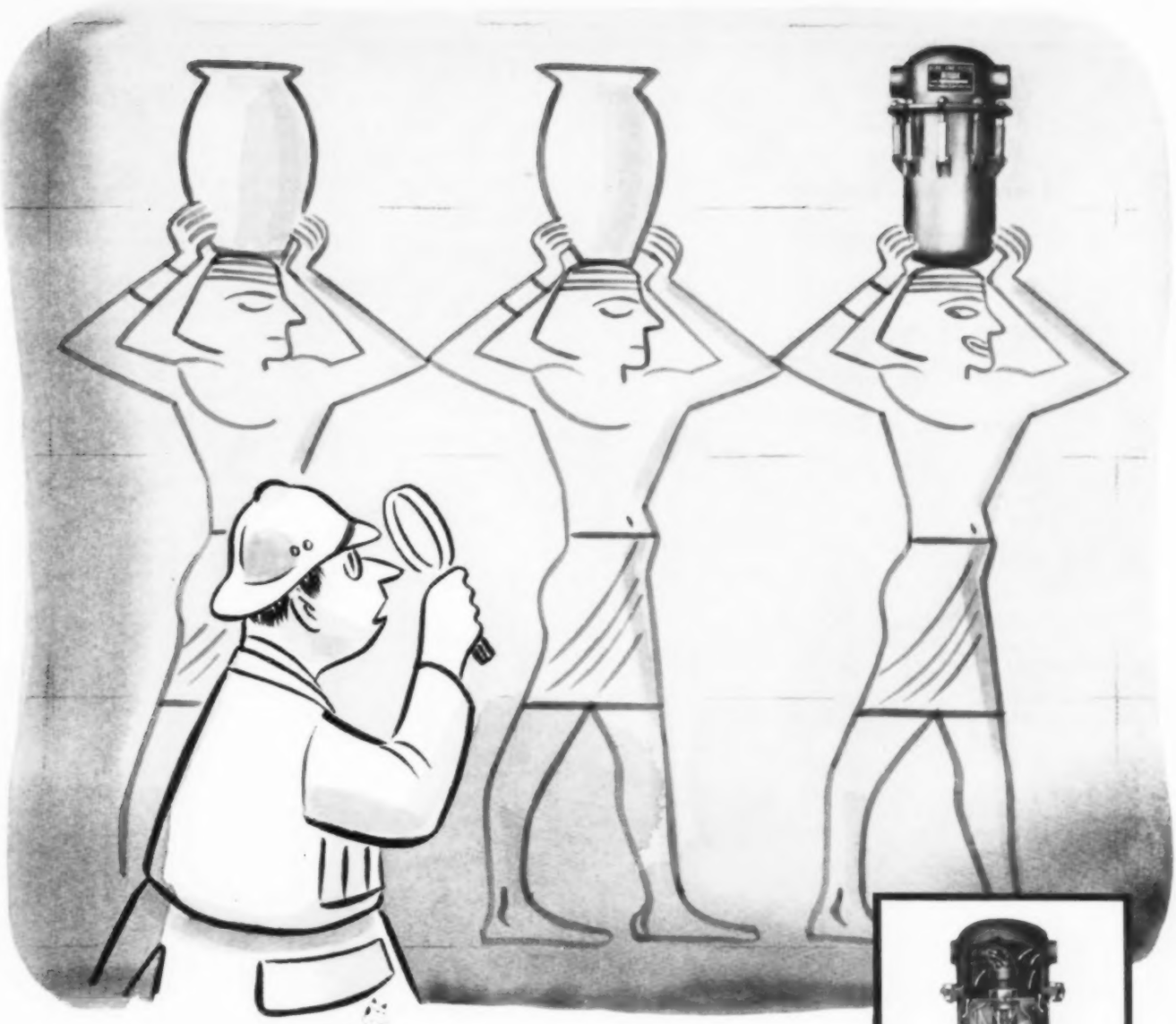

KEEP IT CLEAN by Phil Tration

. . . And the inscription read, "Many a young pharaoh has gained great riches by placing a Staynew filter in the proper place at the proper time."

Seriously, can you imagine how advanced the art of filtration would be today if the Egyptians *had* known about Dollinger Staynew filters? Dollinger is only thirty five years old, and yet Staynew Filters are the recognized standard of quality throughout the world. Moreover, Dollinger Engineers are constantly developing new filters for new applications, and increasing the world's knowledge of this very new art—filtration. May we help you?

STAYNEW MODEL CPH PIPE LINE FILTER has the exclusive "double action principle." Air is first deflected to outer walls of Filters and forced downward at high speed. Water, oil, and heavier particles of rust, etc. are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This "double action" design eliminates need for frequent cleaning.

Inexpensive, simple to install, Dollinger Pipe Line Filters pay for themselves in reduced maintenance alone. Why not talk over your filtration problems with a Dollinger engineer . . . or write for Bulletin 200 which gives engineering data on pipe line filters. Dollinger Corporation, 95 Centre Park, Rochester 3, N. Y.

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STAYNEW **DOLLINGER**

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LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U. S.

Cape Pipe Line Co., Philadelphia, 100 miles, large diameter, Delaware Bay to the Philadelphia refining area, planned.

Chicago District Pipeline Company, 52 miles, 30-36 inch, gas, from Natural Gas' proposed line at Joliet to Chicago, $13 million, before FPC.

Cities Service Gas Co., Oklahoma City, 116 miles, gas, facilities in Kansas and Oklahoma and pipe lines in Kansas, $11.4 million, authorized.

Coastal Transmission Corp., Houston, 574 miles, 22-26 inch, gas, from McAllen, Texas to Baton Rouge, La. connection of Houston, Texas Gas and Oil plus 414 miles of laterals, $55 million, authorized.

Colorado Interstate Gas Co., Colorado Springs, 734 miles, 24-30 inch, gas, from Texas & Okla. Panhandle to Kit Carson, Colo., to Beatrice, Neb., plus four compressor stations, $120 million, before FPC.

Deep Rock Gas Co., Oklahoma City, 120 miles, 6-inch, LPG, from Tioga, N. C., to Canadian border, planned.

El Paso Natural Gas Co., El Paso 888 miles, 6.34 inch, field and main lines, gas, facilities in Texas, New Mexico and Arizona to deliver gas to Southern Calif. Gas Co., Southern Counties Gas Co., and Pacific Gas & Electric Co., $107 million, 290 miles authorized.

230 miles, 5-6 inch, products from Odessa, Texas to the El Paso area, planned.

El Paso Natural Gas Products Co., 240 miles, 8 inch, products, from Midkiff natural gasoline plant in Permian Basin to El Paso, planned.

Everglades Pipe Line Company, Delaware, 60 miles, products, Port Everglades, Fla. south to Miami area, $4 million, contracts let.

Four Corners Pipe Line Co., Houston, 600 miles, 16 inch, crude, from Four Corners area to Los Angeles plus 150 miles of feeder lines, $50 million, contracts let on 485 miles to A. P. Vaughn Construction Co., R. H. Fulton Construction Co. and Potashnick Construction Co.

Great Lakes Pipe Line Co., Kansas City, Mo., 84 miles, 8 inch, products, extension of system to Eau Claire, Wis., contract let to R. H. Fulton and Co.

68 miles, 12 inch, products, from intersection of system with Badger Pipe Line into Chicago, contracts let to M-R Company and Midwestern Contractors, Inc.

140 miles, 8 inch, products, from company's terminal at Minneapolis to terminals at Superior, Wis., planned.

34 miles, 12 inch, from Tulsa to Barnsdall, Okla., contract let to Midwestern Contractors, Inc.

Gulf Interstate Gas Co., Houston, additional compressor facilities in Kentucky, Tennessee, Mississippi, and Louisiana, and 10 miles of gathering lines from Erath field, gas, $24.5 million, temporary authorization.

Houston Texas Gas & Oil Corp., 942 miles, 18-24 inch, gas, Baton Rouge, La., to Miami, plus 682 miles of laterals in Florida and compressor stations, $95 million, authorized.

Humble Oil & Refining Co., 200 miles, main gathering system line of varying sizes, 250 miles, 26 or 30 inch main carrier, gas, from southwest Texas to Houston, plus gas processing and cycling plant near Corpus Christi, $75 million, planned.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, before FPC.

Laurel Pipe Line Co., Philadelphia, 440 miles, 14-24 inch, products, from Philadelphia to Pittsburgh to Cleveland, $50 million, planned.

Magna Pipeline Co., 40 miles, gas, underwater line from Anacortes, Wash., to Victoria, B. C., $6 million, planned.

Michigan-Wisconsin Pipe Line Co., Detroit, 472 miles, 4, 24-inch, gas, main line loops and extensions in Wisconsin, Illinois, $17.6 million, before FPC, temporary authorization for a part, 47.5 miles let to G. E. T. Construction, Inc.

Midwestern Gas Transmission Co., Houston, 2067 miles, 3-24 inch, gas, from Emerson, Manitoba, to Nashville, Tenn., $103 million, before FPC.

Mississippi River Fuel Corporation, 54 miles, 26 inch, gas, paralleling sections of existing system in Louisiana, Missouri and Arkansas plus station facilities, $7 million, before FPC.

Mountain Fuel Supply Co., Salt Lake City, 38 miles, 20 inch, gas, parallel line and facilities to transport gas from Pacific Northwest line in Sweetwater County, Wyo., $3 million, authorized.

Muskegon Pipe Line Corp., Detroit, 1[illegible] miles, 10 inch, crude, from Griffith, Ind., to Muskegon, Mich., contract let to Midwestern Contractors, Inc.

Natural Gas Pipe Line Co. of Americ[illegible] Chicago, 350 miles, 20, 26 inch, ga[illegible] from Wise County, Texas to Frit[illegible] Texas, $28.5 million, contracts let to Eastern Pipeline Contractors and R. H. Fulton Co., River Construction Corp. and H. B. Zachry Co.

25 miles, gas, from Quinduno field in Roberts County, Texas, $3.2 million, authorized.

416 miles, 36 inch, gas, loops at various points along existing line, $76.2 million, before FPC.

337 miles, 30 inch, gas, loop line between company's terminus in Texas and Beatrice, Neb., $62.7 million, before FPC.

59 miles, 36 inch, gas, Beatrice to Joliet, Ill., before FPC.

North Carolina Natural Gas Corp., 640 miles, 2-16 inch, from Transco's system near Mooresville across North Carolina, planned.

Northern Natural Gas Co., Omaha, 167 miles, 20 inch, gas, from Farmington, Minn. to Duluth, Minn., and Superior, Wis., $12 million, before FPC.

42 miles, 10 inch, gas, from Rochester, Minn. to Winona and Goodview, Minn., $963,000, before FPC.

365 miles, gas, new facilities in Minn., Iowa, S. D., Neb., Wis., plus 1090 miles of branch line and station facilities, $65.7 million, authorization for a part.

Northwest Pipeline Corp., Salt Lake City, 350 miles, 6-10 inch, crude and products, Four Corners area to Salt Lake City, $15 million, planned.

Ohio Oil Company, Findlay, Ohio, 350 miles, 12 inch, products, from Wood River, Ill. to Chicago, planned.

Pacific Gas & Electric Co., 1,300 miles, gas transmission, Alberta, Canada to Antioch, Calif., $380 million, planned.

200 miles, 12 inch, gas, from northern Calif. gas fields to Humboldt County, Calif., $9.5 million, contract let to Engineers Limited Pipe Line Co. and Alex Robertson Co.

Pacific Northwest Pipe Line Corp., Salt Lake City, 1000 miles, gas, gathering system in San Juan Basin and sales laterals in Washington plus compressor facilities, $30 million, planned.

112 miles, gas, laterals, in Washington and Idaho, $3.5 million, authorized.

Pennsylvania Gas Co., Warren, Penn., 3[illegible] miles, 8, 10 inch, gas, in Erie and Warren Counties, Penn., and Chautauqua County, N. Y., $2.6 million, authorized.

Permian Basin Pipeline Co., Omaha, 8[illegible] miles, 16 inch, gas, facilities near Spraberry compressor station, Midland County, Texas to tie in with Pioneer

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by the world. Yet his eyes are always on the next horizon . . .
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and oil help make this better world. In our own company alone
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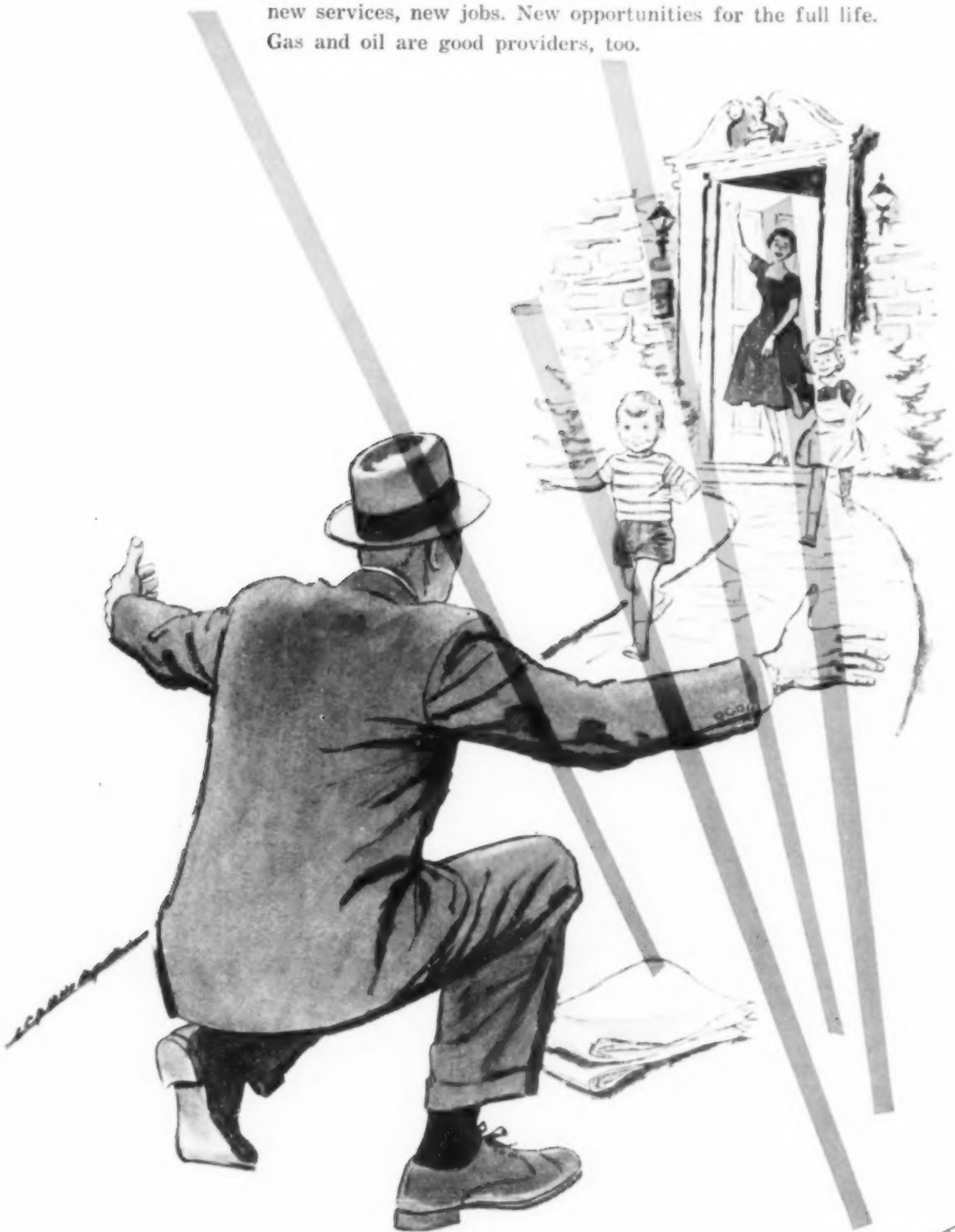
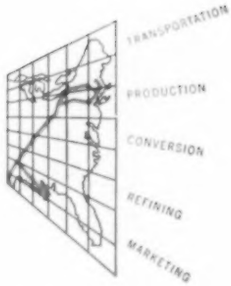
new services, new jobs. New opportunities for the full life.
Gas and oil are good providers, too.



TENNESSEE GAS TRANSMISSION COMPANY
AMERICA'S LEADING TRANSPORTER OF NATURAL GAS
HOUSTON, TEXAS



gathering system, Schleicher County, Texas, $5 million, authorized.

Piedmont Gas Co., Hickory, N. C., 78 miles, 2-8 inch, gas, from connection with Transcontinental Gas Pipe Line to serve customers in North Carolina, $2.6 million, before FPC.

Skelly Oil Co., 38 miles, 8 inch, crude, gathering system extension from Nichols field to southern Kiowa County, Kansas, planned.

Southern California Edison Co., 130 miles, 26 inch, gas, San Joaquin Valley to Los Angeles harbor area, $24 million, contract let to Bechtel Corporation.

Southern Kansas Pipe Line Co., Inc., 200 miles, 6-10 inch, crude, southwestern Kansas to Arkansas City, Kansas, planned.

Southern Natural Gas Co., Birmingham, 60 miles, gas, to connect transmission system to reserves in Plaquemines, St. Bernard and Jefferson parishes, La., and waters adjoining, plus compressor, meter and regulating facilities, $8 million, authorized.

52 miles, gas, various locations in Georgia and Louisiana, $2.2 million, authorized.

Tennessee Gas Transmission Co., Houston, 633 miles, 30 and 24 inch, gas, from Louisiana delta to Portland, Tenn. and Coudersport, Pa. to Hamburg, N. Y., before FPC.

120 miles, 12, 20 and 26 inch, gas, Kinder, La. to offshore fields, authorized.

332 miles loop lines in Tennessee, Kentucky, West Virginia, Ohio, Pennsylvania and Mississippi, 68 miles authorized and contracts let to Harford Brothers Pipe Line Contractors, Bechtel Corporation, Oklahoma Pipe Line Constructors, Pentzien, Inc. and Collins Construction Co., sub-contractor, and 264 miles, before FPC.

Compressor stations in Mississippi, Tennessee, New York, Pennsylvania and additions in Tennessee, Kentucky, Ohio and Pennsylvania, before FPC; $167 million total.

Texas-New Mexico Pipe Line Co., Houston, 515 miles, 16 inch, crude, extension from Jal, N. M. pump station to Four Corners, $6.4 million, planned.

Transcontinental Gas Pipeline Corp., Houston, 317 miles, gas, loop lines and gathering laterals in Texas and Louisiana and compressor facilities in Louisiana, Mississippi, Alabama, Georgia, North Carolina, Pennsylvania and Virginia, $53.7 million, before FPC, temporary authorization for a major part.

Trans-Western Pipe Line Co., gas transmission, Four Corners area to California, proposed.

Trust Pipe Line Co., Big Spring, Texas, 128 miles, 6 inch, products, from Abilene to Wichita Falls, Texas, $1.5 million, planned.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million planned.

United Gas Pipe Line Co., Shreveport, 40 miles, 8 inch, gas, from Baldwin County, Ala. to Container Corp. of America plant, Brewton, Ala., $1.4 million, authorized.

United Natural Gas Co., Oil City, Penn., 50 miles, 12 inch, gas, from Elk County to Jefferson County, Penn., planned.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., Bella Coola, B. C., planned.

Alaska-Yukon Refiners and Distributors, Ltd., Edmonton, Alta., 150 miles, products, serving Alaska and Yukon territory, $3.5 million, planned.

Andes Pipeline Corp., 500 miles, 12 inch, gas, from Villamontes, Bolivia, to Antofagasta, Chile, $30 million, planned.

Bolivian Gulf Oil Co., 201 miles, 8-10 inch, crude, from Sicasica, Bolivia, to Arica, Chile, $10.5 million, planned.

British Petroleum Company, London, 16-inch, crude, from Popton Point, South Wales to Llandarcy refinery, $14 million, considered.

62 miles, crude, from Milford Haven port to Swansea Refinery plus storage tanks and deep water jetty, 10 million, planned.

Canada Southern Petroleums, Ltd., Calgary, 400 miles, crude, from Peace River region of northeast British Columbia to Bella-Coola, planned.

Cie. de Recherche et d'Exploration de Petrole au Sahara, 450 miles, 16 inch, crude, Edjele field in Algeria to a port on Libyan coast, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Creole Petroleum Corp., Caracas, Ven., 94 miles, 30 inch, crude, from Temblador to Caripito, Venezuela, $5.6 million, contracts let to Pipe Line Engineering Co. and Oklahoma Pipe Line Constructors.

East German Government, line from Stettin, Prussia to Dresden or Chemnitz in Saxony, planned.

Empresa Nacionales de Petroleo, Chile, 75 miles, 10 inch, products, from government refinery at Concon to Santiago, planned.

Entre Nazionali Idrocarburi, Rome, Italy, crude, from Qum field in Iran to the Mediterranean Sea, planned.

Gaz de France, 550 miles, 12-24 inch, gas, main line from Lacq field near Spanish border to Paris plus 450 miles of branch lines to Lyons, Nantes and Chateaurous, contracts let.

Hydrocarbons Pipeline, Ltd., Winnipeg, Manitoba, 880 miles, 6-8 inch products from Edmonton, Alta. to Winnipeg, $35 million, planned.

India Government, 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, proposed.

Iraq Joint Venture Pipe Line, 1200 miles, 38-40 inch, crude, from head of Persian Gulf through Iraq to Turkish coast of Mediterranean, $840 million, planned.

National Iranian Petroleum Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran, $5 million, planned.

Paraguay and Bolivia Governments, 450 miles, 6⅝ inch, crude, from Villa Montes, Bolivia, across the Chaco, to the Paraguay River, later to Asuncion, $14 million, planned.

Petroargentina, Bahia Blanca, Argentina, 370 miles, 16 inch, crude, from Neuguen to Bahia Blanca, Argentina, $4[illegible] million, planned.

Petroleos Mexicanos, 150 miles, 14 inch gas, from J. Colomo field to Minatitlan, $5 million, planned.

80 miles, 8 inch, products, from Guaymas to Los Mochis, $1 million, planned.

150 miles, 22-inch, gas, from Monterrey to Reynosa to tie into Texas Eastern system, planned.

Producers Pipelines, Ltd., Regina, 20 miles 12 inch, crude, Alida to Carnduff-Glen Ewen area of Saskatchewan plus 34 miles of gathering line, planned.

Royal Dutch Oil Co., 155 miles, 24-3[illegible] inch, from German Rhineland to mouth of Rhine River, planned.

Royalite Oil Co., Calgary, 380 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, planned.

Saharian Pipe Line Co. (subsidiary of Cie. Francaise des Petroles, Algerie), 100 miles, 6 to 10 inch, from Hassi Messaoud field to Touggourt, Algeria, planned.

Saskatchewan Power Corp., Regina, Sask., 80 miles, gas, Hatton gas field to Success, Sask., planned.

40 miles, gas, Moose Jaw to Regina, Sask., planned.

Stanmount Pipe Line Co., 140 miles, 10 inch, crude, Cayiga and Beaver Lake fields, N. D., to connect with Interprovincial Pipe Line, planned.

Sturgeon Pipe Line Co., 100 miles, 12-inch, Sturgeon Lake field to Trans-Mountain system, $6.5 million, planned.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

Trans-Canada Pipe Line, Ltd., Calgary, Alta., 2250 miles 36 inch, gas, Alberta to eastern Canada, $378 million; contracts let for 12 spreads.

Trans-Europe Pipe Line, 500 miles, 30 inch, crude, from Mediterranean to northern Europe, considered.

Trans-Mountain Oil Pipe Line Co., 100 miles, loops near Kamloops, B. C. and Edson, Alta. plus pump station, tank farm and three temporary stations, $40 million, planned.

Westcoast Transmission Company, Ltd., Calgary, 270 miles, 8-26 inch, gas, various locations in Peace River region, contracts let for 155 miles.

174 miles, 30-inch, gas, Savanna Creek gas field, Alberta, to British Columbian border, planned, $45 million.

Winnipeg and Central Gas Co., Winnipeg, Mant., 450 miles, 4-8 inch, LPG, from Tioga, N. D. to Winnipeg, Canada, $20 million, planned.

Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina, 1056 miles, 24-inch gas, Campo Duran to Buenos Aires, Argentina, plus four compressor stations, $95 million, planned.

621 miles, products, Mendoza to San Lorenzo, Argentina, $19 million planned.

281 miles, 12¾ inch, crude, Pichana to San Miguel Tucuman, planned.

12¾-10¾-inch, crude, Tucuman to Cordoba to Rosario, proposed.

These Pipeline Jobs Profited from Bucyrus-Erie Dragshovels — Yours Can Too!

PENNSYLVANIA — This 22-B dragshovel is one of several digging trench for a 24-in. natural gas line across the northern section of Pennsylvania. On jobs like this, profitable dragshovel service is assured by Bucyrus-Erie top quality construction.

ARIZONA — Heavy digging in malapai rock, conglomerate, and dirt . . . hard going up and down steep grades — these and other conditions gave the 22-B shown here a chance to demonstrate its ability to work fast in any type of digging. It was one of three Bucyrus-Eries working on a 256-mile gas transmission line in Arizona.

NEW YORK — For trenching work, the 22-B may be equipped with tractor-type crawlers which help the machine clear obstacles by raising it higher off the ground. Deep grousers provide good traction in soft material. This gas pipeline job is in downstate New York.

CANADA — To construct a pipeline from the Coleville gas fields to Prince Albert in central Saskatchewan, a new company was formed, drawing experienced men from many areas. These men knew what equipment was best suited to the situation — equipment that could move with a minimum of breakdowns. They chose Bucyrus-Erie. On this 226-mile spread, running through British Columbia and the Yukon Territory, this dragshovel bit through rock, gravel, sand, muskeg and tundra.

Whatever trenching conditions you encounter, you can profit from the extra working ability of a Bucyrus-Erie 22-B dragshovel. From the ground up, these machines are designed and built to put power to work moving dirt with maximum efficiency.

See your Bucyrus-Erie distributor soon for more information on ¾-yd. and other sizes of dragshovels.

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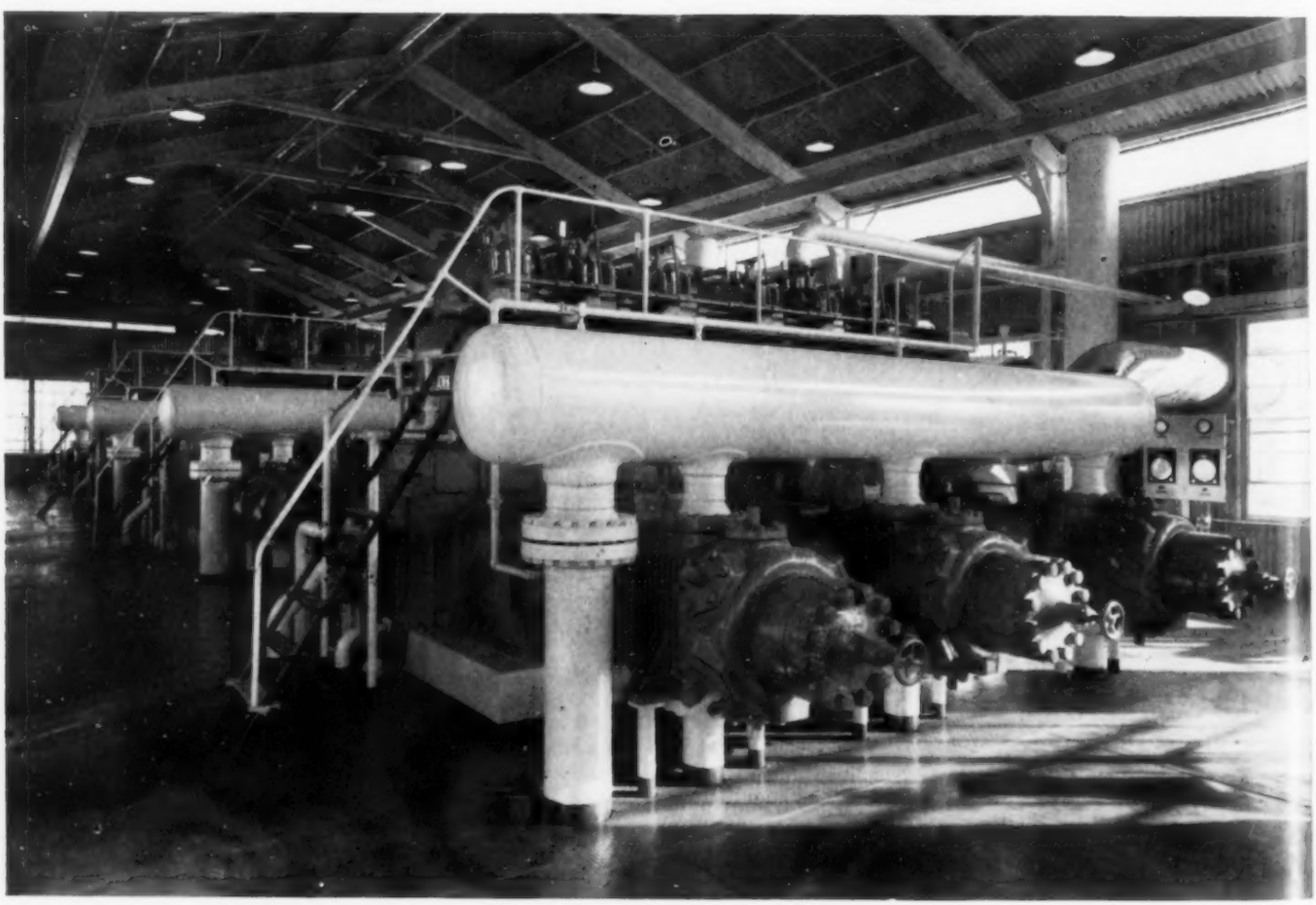

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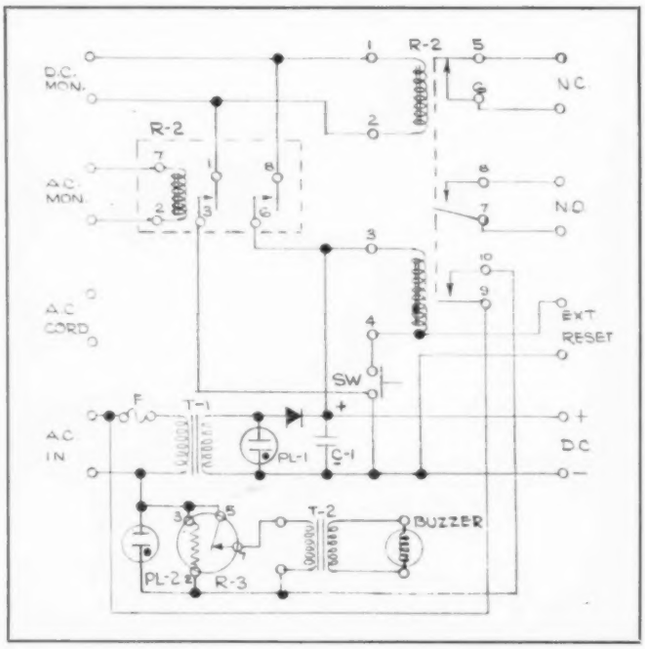
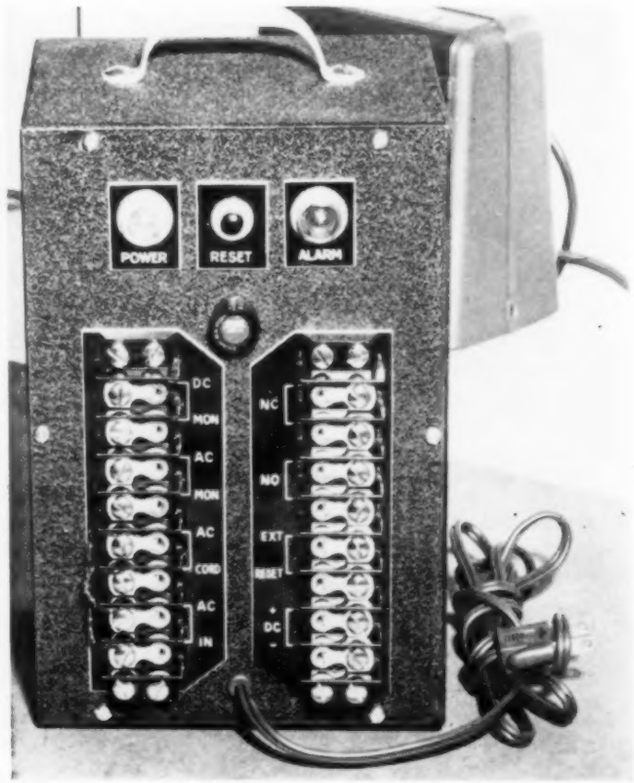


"Circuit Sentry" Helps Locate Intermittent Faults

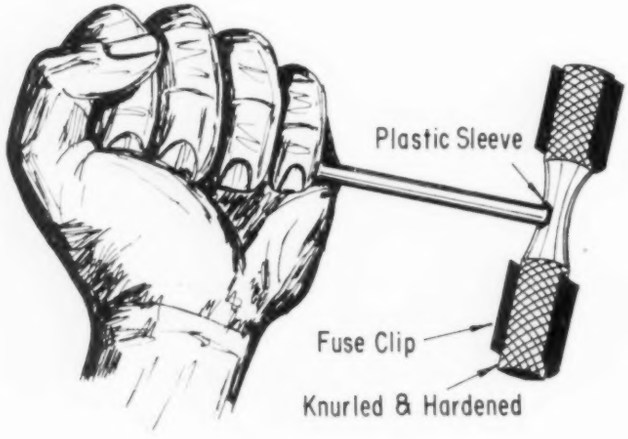
Location of intermittent faults in an electrical circuit can be a time-consuming job. One microwave engineer devised this instrument to help track them down. It virtually eliminates the need for constant attendance of a repairman at the scene of trouble.

The schematic diagram shows how the unit was built.



When it is connected into a circuit where trouble may be anticipated, it will sound off immediately upon the opening or closing of contacts. The buzzer alarm sounds for two minutes and a signal light flashes on and remains lighted until the "sentry" is reset. It may be reset either manually or by remote control.

Corrosion Is Removed By Fuse Clip Cleaner



Cleaning the inner surfaces of fuse clips on communications and control gear can be a time-consuming and inefficient job using sandpaper. A good clean contact assures low voltage drop and prevents excessive heating.

This handy little tool was made on a lathe by cutting a piece of steel stock to the same length and diameter as the fuse to be installed in the clip. A hole was drilled and tapped for the handle; ends were knurled deeply and hardened. Rod stock was cut and threaded for the handle and insulated by a plastic sleeve.

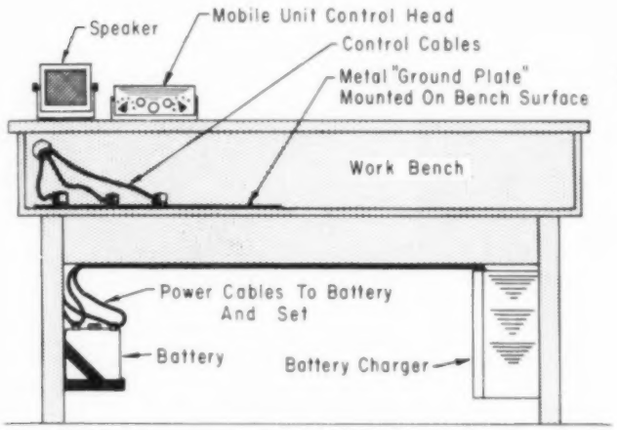
To use, voltage was first removed from the circuit and the tool inserted in place of the fuse. Swinging the handle back and forth a few times removes corrosion products and gives a clean contact.

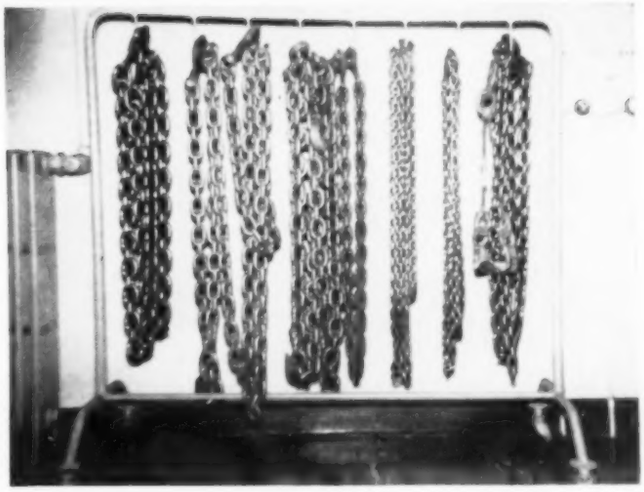
This tool is particularly useful in maintenance of mobile radio equipment where the "A" lead fuse is mounted under the hood and subject to active corrosion.

"Mock-Up" Installation Simplifies Major Repairs

In performing mobile receiver alignment and major repairs properly, a unit must be removed from the vehicle. To execute the work efficiently, a "mock-up" installation can be of great help.

The installation shown requires the use of an extra control head and an extra set of cables but the advantages gained may be well worth it. A battery charger and a storage battery can be used for a power source to furnish steady DC voltage. This set-up can save many maintenance man hours.





Scrap Pipe, Rods Used To Construct Chain Stand

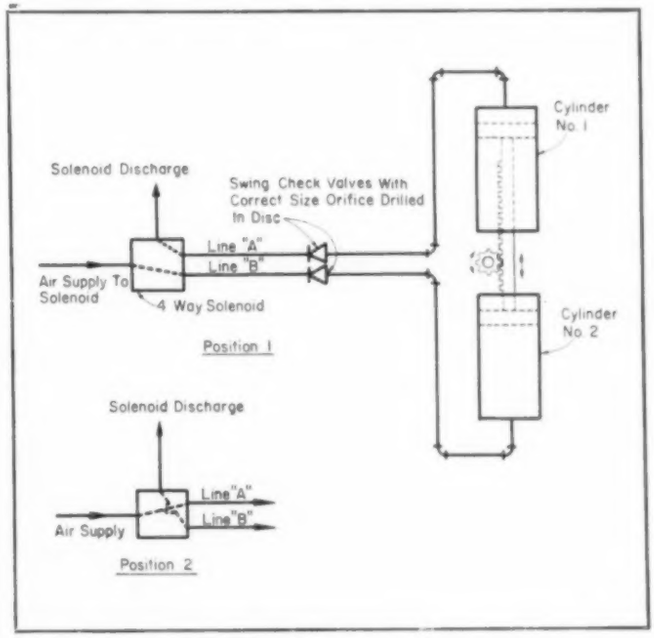
To hold the many small chains and lifting devices needed in pump station maintenance work this mobile rack made from scrap ½-inch pipe, will do the job. Ordinary heavy duty chair casters are mounted as wheels for each leg. The hooks for hanging chains, etc., can be made from scrap sucker rods or ¼-inch welding rods. Storage and transportation problems for these necessary tools are solved in one compact stand.

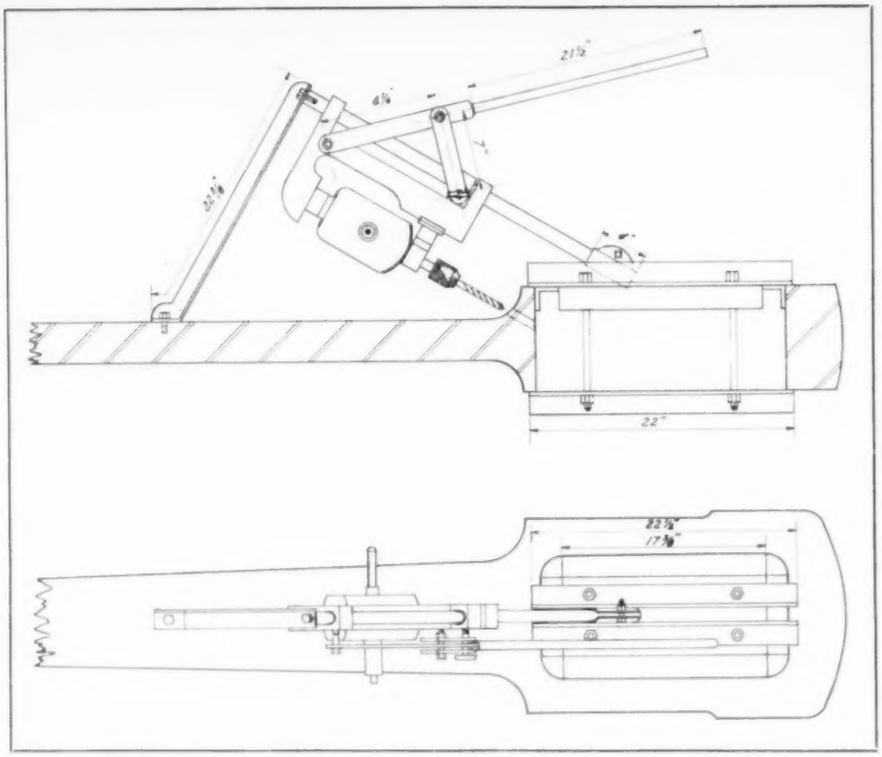
Install Cushion Process For Air Operated Valves

Save your air-operated valves by installing swing check valves, with orifices drilled in the disc of each check valve. In a set-up like the one illustrated, the two air cylinders are used to operate valves by remote control—a four-way solenoid valve in the air supply line is commonly used. The restricting choke normally used, when the operation is controlled by a hand-operated valve, has been removed because the solenoids must discharge to atmospheric pressure in order to operate properly. In the absence of any restraining choke, the discharging cylinder no longer cushions the operation—the result is a violent slamming of the valve when going to a fully open or closed position.

This problem can be avoided by the placing of swing check valves in the air lines, and a restricting orifice can then be made by drilling a predetermined size hole in the disc of each check valve. The size of the orifice is dependent only on the time required to complete the operational cycle.

When the air is switched from Line "B" to Line "A" by energizing the solenoid, Line "B" becomes the discharge, exhausting cylinder 2 while cylinder 1 is being loaded. The swing check on Line "A" opens and allows full-stream flow—the check on Line "B" closes, allowing air to pass slowly through the orifice, and provides the cushioning effect. When the solenoid is operated again, the process is reversed.





Drilling Jig Caps Crank Rods For Forced Feed Lubrication

In drilling holes in crank rods to facilitate forced feed lubrication on cross head bearings, one company developed the novel rig illustrated.

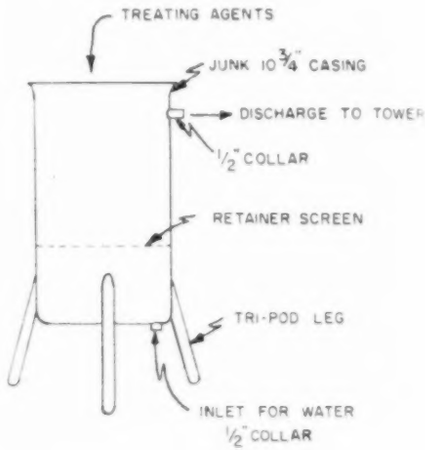
The holes had to be drilled from the outside at an angle leading to the center of the rod. The jig is bolted to the crank rod and operated by hand lever arrangement. This enables the operator to place sufficient pressure on the drill head without causing the drill to veer from its path.

The resulting hole can be equipped with the necessary fittings to convert to a forced feed lubrication system with a minimum of time and labor.

Homemade Reservoir Treats Cooling Water

To eliminate the necessity of climbing to the top of the cooling tower to disburse the chemical treating agents use this easy-to-build, homemade reservoir. Made from a short length of 10¾-inch casing, this reservoir is connected to the main water supply line by a small ½-inch bypass line. The treating chemical is placed on the retaining screen, and water passing through reservoir dissolves and disburses it at a uniform rate.

More effective distribution is obtained, and the use of this method promotes safety and saves the time used in climbing the tower to add treating agents to the water.



Regulate Engine Speeds With Aid of Diaphragm

It is difficult to keep the necessary power output with an engine governor, when the discharge pressure of a pump varies from atmospheric pressure to several pounds. The result is an engine running too fast under light loads.

An arrangement has been made by installing a diaphragm on the pump outlet and running a rod to the gas inlet on the manifold of the carburetor. A check valve was placed in the by-pass line around the pump.

The fluid flows through the valve, and when the pressure builds up the diaphragm closes the throttle on the power unit. As long as the line is operating under a vacuum, the engine runs at idling speed. When the pressure builds up, the throttle opens on the engine, and fluid is put through the line to the tanks.

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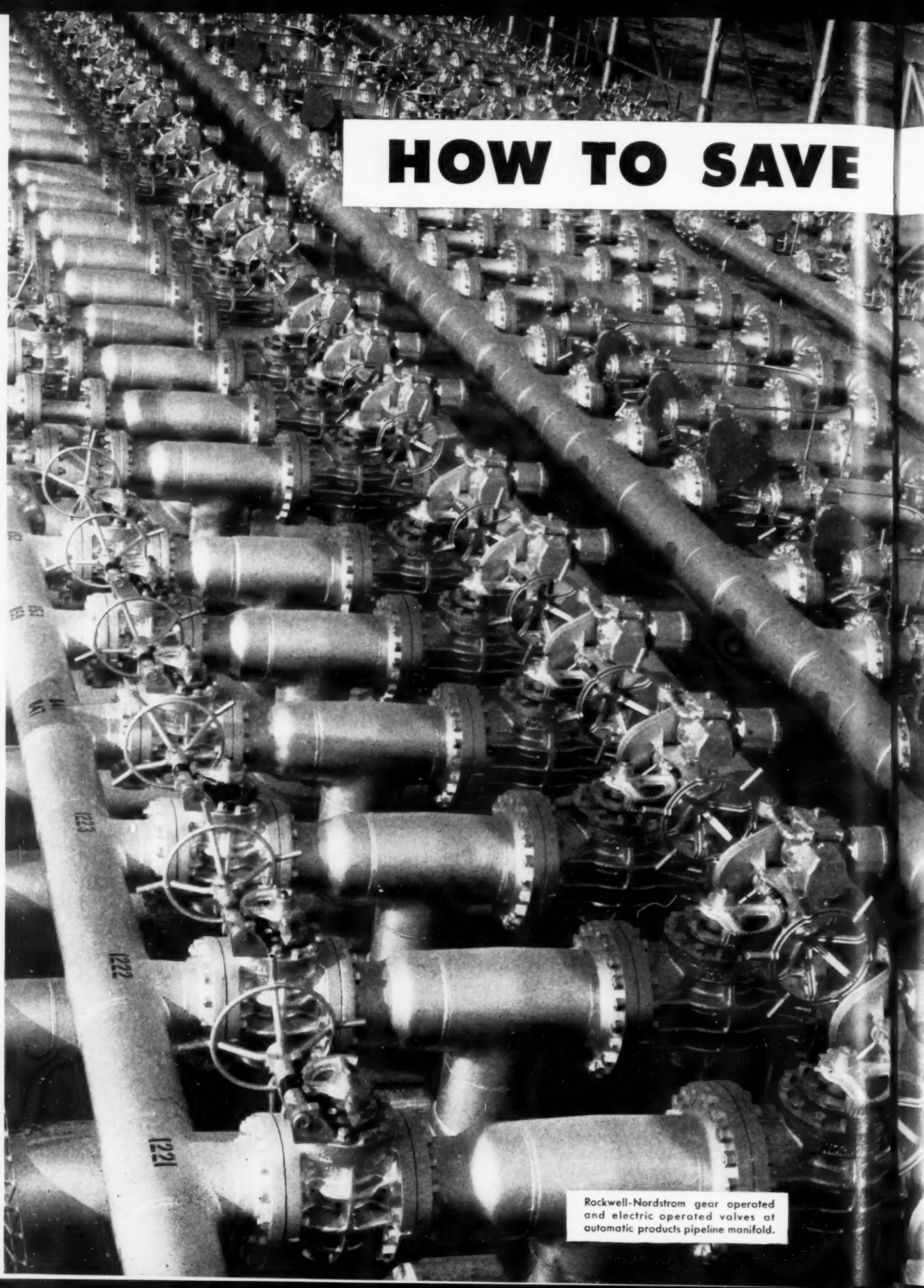


Rockwell-Nordstrom gear operated and electric operated valves at automatic products pipeline manifold.

MONEY ON MANIFOLDS

...and get better flow control

One lone valve that leaks or causes maintenance problems may not be too noticeable. But a pipeline manifold with *hundreds* of valves is a different matter. That's why you so often see huge manifolds (like the one at the left) 100% equipped with Rockwell-Nordstrom lubricated plug valves. Here's why they will save you money and assure better flow control year after year:

Lower Maintenance: Lubrication is preventive maintenance against repair and replacement . . . trouble doesn't have a chance to start. Also, the seats are *never* exposed to the line.

Longer Life: Lubrication prevents the grinding wear of metal-to-metal friction that ruins ordinary valves so quickly.

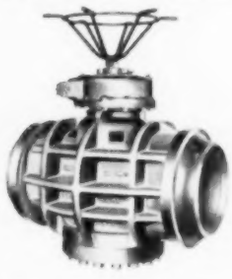
Positive Shut-Off: Costly product loss and contamination are eliminated because pressurized lubricant forms a tough, instantly replaceable seal that can't "wear out."

Compact Design: There are no bonnet cavities or rising stems. They can be manifolded much tighter . . . cuts investment in pipe, flanges, fittings, etc.

Rockwell-Nordstrom lubricated plug valves are available in a complete range of sizes and pressure ratings to meet your every pipeline need. They can be supplied with electric, hydraulic or pneumatic motor operators for automatic and remote operation. And they cost no more to buy—often less—than ordinary valves. See your supplier or write Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited.

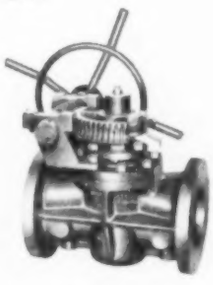
ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-Off



Rockwell-Nordstrom Hypreseal valves for pressures to 10,000-lb WOG and in sizes to 30" by 34".

Rockwell-Nordstrom Multiport 3-way valves for pressures to ASA 1,500-lb WOG and in sizes to 16".



Rockwell-Nordstrom Standard valves for pressures to ASA 600-lb and in sizes to 30".

Pipe Line Men

IN THE NEWS

N. E. Tanner

Charles S. Coates

Trans-Canada Pipe Lines Limited elected former president **N. E. Tanner** chairman of the board at a recent meeting. **Charles S. Coates,** formerly executive vice president and general manager, was named president. Tanner's headquarters will be at Calgary and Coates will continue to maintain offices in Toronto.

Tanner became Canada's Speaker of the House and later Minister of Lands and Mines. He resigned the latter job in 1952 to become president of Merrill Petroleums Limited. He became Trans-Canada's president in 1954. Coates started in the oil business in 1936 and in 1943 joined Tennessee Gas Transmission Company. After having been made senior vice president in 1951, he left Tennessee Gas in 1954 to become executive vice president of Trans-Canada.

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Pencol Pipeline Engineering Consultants has been organized in London, England to design and engineer pipe lines, pumping stations and auxiliary equipment. The new firm includes **K. A. Spencer, J. de Waele, R. W. Stephenson, A. E. Crisp, P. W. Heselgrave** and **P. A. Tracy** as partners. Associated with them are **N. Tetlow** and **R. G. Lamb.**

•

S. D. Bechtel of Bechtel Corporation and **V. G. Hindmarsh** were recent recipients of one of the highest lay awards conferred by the Roman Catholic Church. The presentation honored each as a Knight of the Order of St. Sylvester Pope for special services to the peoples of the Middle East. The decoration is given to laymen, regardless of their religious faith, only by papal decree. It is intended as a reward for outstanding deeds in favor of the Church or society.

•

Sinclair Pipe Line Company recently announced several appointments. **E. N. Little,** Houston district superintendent, has been named assistant division manager of the Texas division with headquarters at Fort Worth, Texas. **J. R. Ligon** will take over the duties of assistant chief general engineer at Independence, Kansas, but will remain on temporary assignment in Fort Worth.

R. J. Eubank has been named acting district superintendent of the Houston district and **J. B. Gossett** is now acting assistant district superintendent.

Other changes include **H. V. Watkins** as assistant district superintendent of the Wichita Falls district, **E. I. Leabo** as assistant chief general engineer and **R. H. Meyer** as project engineer of the company's General Engineering department. The last two will be located at Independence.

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Noble D. Travis was recently appointed director of public relations for **Michigan Consolidated Gas Company.** He joins Michigan Consolidated after 27 years with the Detroit Trust Company where he has been vice president in charge of public relations since 1945.

Named as director of press relations was **William M. Hutchins.** Hutchins, a former Detroit and Pontiac newspaperman, has been director of public relations in Michigan Consolidated's outstate districts since 1951.

o

Several additions have been announced by **Pipe Line Technologists, Inc. Ralph C. Hughes, Jr., Richard D. Hull** and **Richard S. Barfield** have been added to the firm's engineering staff and William E. Neptune has assumed the newly created position of assistant to the president.

Ralph C. Hughes, Jr.

Hughes, formerly associate editor of PIPE LINE INDUSTRY, was with Sun Pipe Line Company for over eight years in various operating and engineering positions. Hull was with Sun Oil Company for eight years in engineering positions involving gas handling and processing.

Barfield worked with Gulf Refining Company for seven years in pipe line design and had previously worked on equipment design for Beaumont Iron Works. Neptune has had experience with Texas Butadiene & Chemical Corporation and Pan American Petroleum Corporation.

•

E. L. Rutherford has been named manager of the Tulsa office opened by **Jones, Shelburne & Pellow Oil Co.** of Oklahoma City and **Julian Oil and Royalty Co.** of Russell, Kansas.

•

Natural Gas Pipeline Company of America has announced these personnel changes. **D. A. Hardesty,** assistant vice president in charge of employe and public relations, was named vice president in charge of the same area. **C. E. Holmes,** vice president in charge of sales, and **Remick McDowell,** executive vice president of Peoples Gas Light & Coke Company, the parent firm, were named to the board of directors of Texas Illinois Natural Gas Pipeline Company and NGPL respectively.

o

Leonard C. Swing and **William N. Shelbaer, Jr.** of **Hope Natural Gas Company** have received promotions. Swing was recently made superintendent of construction. Shelbaer was promoted to supervisor of inventory control.

Swing began working for Hope in the Station department in 1936. He became a chemist at the Hastings By-Products plant and was made a general foreman there in 1953. Shelbaer has been with Hope since 1939.

J. B. Eaton, Jr.

J. Ray Fisher

J. B. Eaton, Jr. has succeeded **J. Ray Fisher** as superintendent of **Texas Gas Transmission Corporation's** Compressor Station department. Eaton has been an employe of the Texas Gas and a predecessor company, Memphis Natural Gas Co., for ten years. He became assistant superintendent of the Texas Gas Compressor Station department in 1949. Retiring to devote full time to personal interests, Fisher will be available to Texas Gas in a consulting capacity. He joined the company in 1949 and was made Compressor Station superintendent later that same year. **T. L. McWilliams** has been chosen to succeed Eaton as assistant superintendent of the Compressor Station department. McWilliams has been employed by Texas Gas and Memphis Natural since 1936. He has been a Texas Gas Compressor Department division superintendent with headquarters at Memphis since 1950. The new appointments will be located at the general offices, Owensboro, Ky.

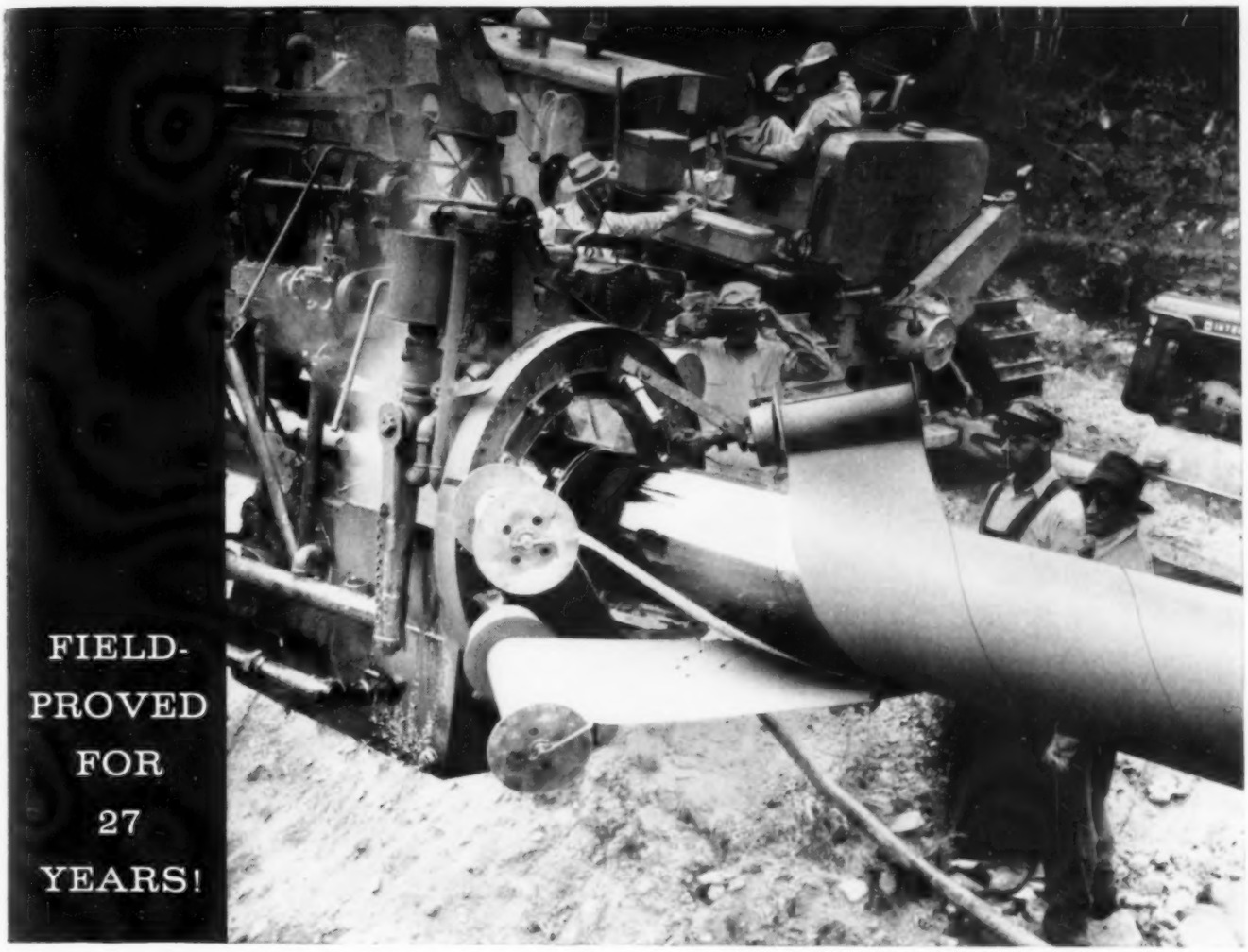
•

Richard P. Cocke has been elected vice president of the **Trans-Arabian Pipe Line Company.** Cocke joined the Texas Company in 1928, later served with California Texas Oil Company and in 1951 he joined Tapline where he has been serving as comptroller, secretary and treasurer. Cocke will retain his latter two posts and **O. T. Swanson** will succeed him as comptroller.

•

The Canadian Gas Association has recently elected its 1957-58 board of directors. Chosen were **H. C. Darroch,** Ontario president; **H. L. Purdy,** Vancouver, first vice president; and **R. C. McPherson,** Alberta, second vice president.

Directors are **T. E. Cross, K. Lucas, O. B. Loberg, O. L. Jones, G. E. Downie, L. C. Whealy, A. J. Strain, G. M. Douglas**



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Since 1930, Carey Asbestos Pipeline Felt has performed successfully under the toughest possible field conditions. Now, with exclusive, new electronic "*AccuRay*" watch-dogging every step of the manufacturing process, even better quality and more uniform strength are assured. Weak spots in the felt are eliminated—every inch of underground piping receives maximum protection.

Protect *your* investment! Give pipe coatings the best possible shield against soil stress with Carey Pipeline Felt—now stronger with electronic "*AccuRay*"!

For free booklet of a Corrosion Engineer's own analysis of pipeline protection problems, write Dept. PLI-87.

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ASK YOUR CAREY SALES ENGINEER ABOUT THESE OTHER CAREY WRAPPING MATERIALS

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CAREY PIPELINE PADDING—Strong and flexible. Molds easily to the shape of the pipe without grooving or weakening. *The original pipeline padding!*

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Also on the board of directors are **F. F. Palin,** immediate past president and **W. F. Dalton,** association general manager.

•

Roy E. Nelson

Roy E. Nelson ha been elected vic president of th **American Gilsonit Company** and wi also continue as man ager of production Nelson joined th company in 1949.

•

Hoover L. Gibson has recently taken over duties as superintendent of compressor engineering for **Texas Gas Transmission Corporation.** In addition, he will assume responsibility for compressor design on August 1. Gibson has been employed by Texas Gas since 1948 and was promoted from the position of Division III superintendent in the Compressor Station department.

•

Ray C. Fish of Fish Engineering Corporation was awarded an honorary degree of Doctor of Business Administration recently at Denison University, Granville, Ohio. Fish is board chairman of Fish Engineering Corporation and affiliated companies and serves as director of various other companies.

•

Michigan Consolidated Gas Company has announced the election of **Ray R. Eppert** to the board of directors. Eppert, executive vice president of Burroughs Corporation, began his career with the Detroit office machinery manufacturer in 1921 as a shipping clerk. He became a director of Burroughs in 1948 and executive vice president in 1951.

•

J. D. Bland of Shreveport has been named general superintendent of the petroleum products division for **Texas Eastern Transmission Corporation.** Bland has been with Texas Eastern since Triangle Pipeline Company became a part of the parent company in 1955. Since that time he has served as acting supervisor of the Products division engineering department. His new duties call for the supervision of all operations of Texas Eastern's petroleum products system.

J. D. Bland

•

Southern Counties Gas Company recently announced the election of **Alan R. Bailey** to the board of directors. Bailey is now senior vice president after joining Southern Counties in October of last year. Prior to that he was assistant to the president of Pacific Gas and Electric Co.

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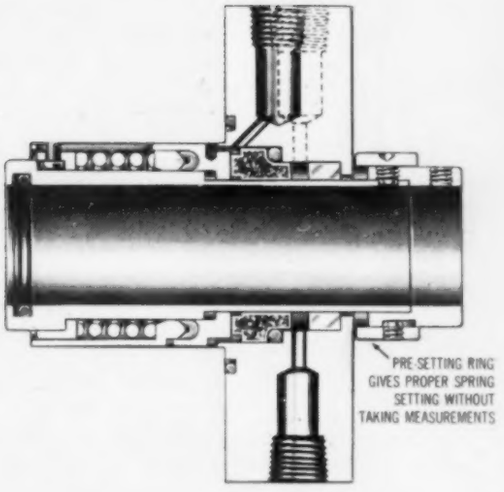
BJ Mechanical Seal

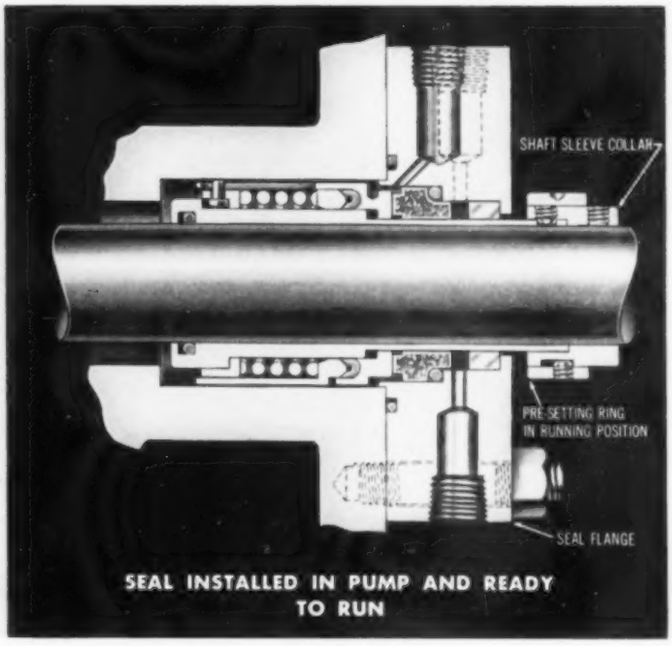
with automatic Pre-Setting Ring (Patent Pending)

assures perfect installation

...without measurement



SEAL ASSEMBLED FOR INSTALLATION AS A CARTRIDGE UNIT



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Perfect installation of BJ Mechanical Seals is now "built in" by this exclusive BJ Pre-Setting Ring. Anyone with a wrench and a screwdriver now can perfectly install or replace BJ Mechanical Seals. No measurements, no installation drawings, no field fitting required.

This new development provides a seal *assembled as a cartridge unit*—ready for installation. The BJ Pre-Setting Ring is attached to the shaft sleeve collar with a set screw in a slot of controlled length.

You simply slip the "packaged" seal on the shaft and into the stuffingbox... bolt the seal flange to the stuffingbox and the shaft sleeve collar to the shaft... then move the Pre-Setting Ring the length of the set screw slot and lock in place. Your seal is now in precise running position with the spring compressed to its proper tension.

Save time and labor on initial seal installation and on periodic pump inspections. *Specify BJ Mechanical Seals with exclusive Pre-Setting Ring.*

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Byron Jackson Pumps, Inc.

A Subsidiary of Borg-Warner Corporation

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WHO'S MEETING WHERE

August

North Dakota Oil & Gas Association, Annual Meeting, Bismarck, N. D., Aug. 19-20.

Appalachian Gas Measurement Short Course, 17th Annual Meeting, West Virginia University, Morgantown, W. Va., August 26-28.

Instrument Society of America, International Symposium on Gas Chromatography, Kellogg Center, Michigan State University, East Lansing, Mich., Aug. 28-30.

September

Pacific Coast Gas Association Convention, Fairmont and Mark Hopkins Hotels, San Francisco, Sept. 3-5.

New Jersey Gas Association, Annual Meeting, Spring Lake, New Jersey, Sept. 6.

Independent Natural Gas Association of America, Annual Meeting, Shamrock Hilton Hotel, Houston, Sept. 9-10.

AIEE, Annual Meeting, Penn-Sheraton Hotel, Philadelphia, Sept. 9-11.

Electrical Conference of the Petroleum Industry, AIEE Petroleum Industry Committee, Penn-Sheraton Hotel, Philadelphia, Sept. 9-11.

National Petroleum Association, 55th Annual Meeting, Traymore Hotel, Atlantic City, N. J., Sept. 11-13.

Midwest Gas Association, Gas School and Conference, Iowa State College, Ames, Iowa, Sept. 11-13.

12th Annual Instrument-Automation Conference and Exhibit, Auditorium, Cleveland, Ohio, Sept. 11-15.

Southeastern Gas Association Convention, Robert E. Lee Hotel, Winston Salem, North Carolina, Sept. 18-20.

Oklahoma Utilities Association, Gas Division Conference, Skirvin Hotel, Oklahoma City, Sept. 20.

ASME, 12th Annual Petroleum Mechanical Engineering Conference, Mayo Hotel, Tulsa, Sept. 22-25.

American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Mayo Hotel, Tulsa, Sept. 23-25.

Mid-Continent Oil and Gas Association Louisiana-Arkansas Division, Roosevelt Hotel, New Orleans, Sept. 26-27.

Natural Gasoline Association of America, Oklahoma Regional, Skirvin Hotel, Oklahoma City, Okla., Sept. 27.

October

Texas Mid-Continent Oil & Gas Association, 38th Annual Meeting, Texas Hotel, Fort Worth, Oct. 1-2.

NACE, North Central Region, Sherman Hotel, Chicago, Oct. 1-4.

NACE, South Central Region, City Auditorium, Oklahoma City, Oct. 1-4.

The Society of Petroleum Engineers, AIME, 32nd Annual Fall Meeting, Adolphus, Baker and Statler Hilton Hotels, Dallas, Oct. 6-9.

American Gas Association, Kiel Auditorium, St. Louis, Mo., Oct. 7-9.

National Electronics Conference, co-sponsored by Illinois Institute of Technology, two other universities and two technical societies, Hotel Sherman, Chicago, Oct. 7-9.

AIEE, Morrison Hotel, Chicago, Oct. 7-11.

Oil Progress Week, Oct. 13-19.

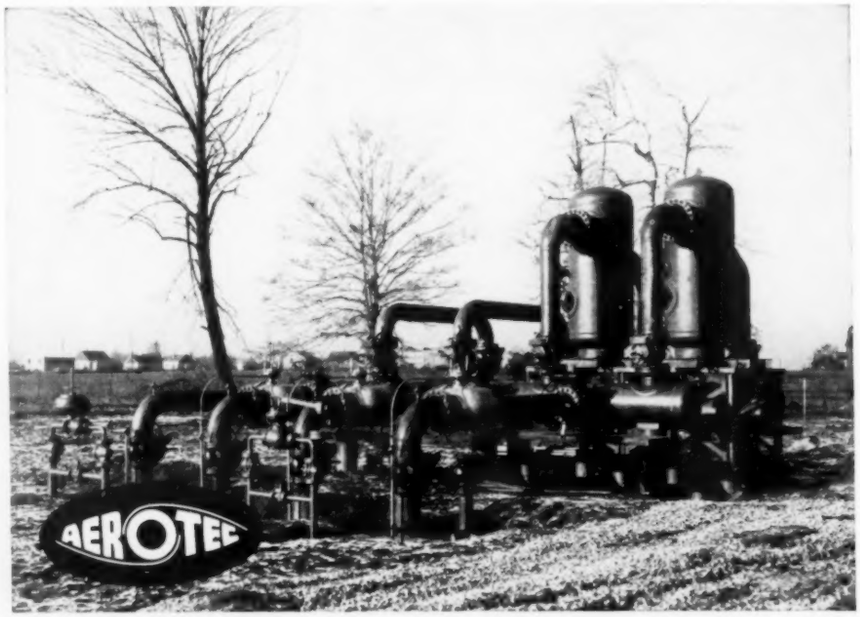
NACE, Western Regional Conference, U. S. Grant Hotel, San Diego, Oct. 22-24.

NACE Western Region Meeting, U. S. Grant Hotel, San Diego, Calif., Oct. 23-25.

Seventh Biennial Permian Basin Tour, Odessa-Midland area, Oct. 23-25.

Natural Gasoline Association of America, Southern Regional, Washington-Youree and Captain Shreve Hotels, Shreveport, La., Oct. 25.

Independent Petroleum Association of America, Annual Meeting, Statler-Hilton Hotel, Dallas, Oct. 27-29.



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The development of the Aerotec Dry Gas Scrubber several years ago provided the First Scrubber to assure clean gas with no carry-over of liquids or solids.

Multiple small-diameter cyclone tubes create a high centrifugal force, resulting in the removal of solids and liquids without the use of wetting agents. The result is a dry, clean product.

This principle assures high efficiency, and continuous discharge of contaminants with no pressure build-up.

Since the installation of the first Aerotec Scrubber, a continuous program of research and development has produced several new and outstanding design and applications of this principle. Our Project Engineers, with years of experience in this field, will be glad to help you in working out your problems. Why not contact them today?

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That's why so many pipe line builders depend on Kaiser Steel for quality pipe to meet API specifications—*delivered as scheduled.*

Next time you are ordering line pipe, specify Kaiser Steel Line Pipe. Rely on Kaiser Steel quality and service to add dollars to your operating profits.

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Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

What's Happening

AMONG SERVICE AND SUPPLY MEN

John Delaney

Edward Cooley

Alco Products, Inc., Elects Two New Vice Presidents

ALCO Products, Inc., announced the election of John P. DeLaney, former general manager of the company's Transportation division, as a vice president. DeLaney will be in charge of operations in both the transportation and spring and forge divisions.

DeLaney joined the company at Schenectady in 1937 in the Manufacturing department.

Edward N. Cooley has been appointed vice president and will be in charge of the company's Thermal Products and Petroleum Industry Equipment divisions.

He joined ALCO's predecessor, the American Locomotive Company in 1920, as a timekeeper.

LeTourneau Gives Mitchell Eastern Sales Managership

Appointment of D. H. Mitchell as eastern sales manager for the LeTourneau-Westinghouse Company has been announced. The position places him in charge of operations of the company's Eastern Sales division which includes 21 states and 4 Canadian provinces.

D. H. Mitchell

Mitchell replaces James A. Vincent, who recently resigned to become vice president and general manager of Adams Construction Equipment Company, a new LeTourneau-Westinghouse distributorship being organized in the state of Florida.

McClintock Is Sales Manager For Kerotest Manufacturing

Jack M. McClintock has been appointed sales manager, Steel Valve division of Kerotest Manufacturing Company, Pittsburgh, Penn. McClintock was formerly special products representative for the Miller Printing Machinery Co., Pittsburgh, Penn.

Atlas Exploration Becomes Atlas Laboratories, Inc.

The name of Atlas Exploration Co., Houston, has been changed to Atlas Laboratories, Incorporated, to reflect more accurately the nature of the company's activities.

It was emphasized that all officers will remain the same and that the company will continue to produce and market its advanced line of gravity meters and gas detectors.

Phillips Appointed General Electric Marketing Research Specialist

Maxwell G. Phillips has been appointed specialist, marketing research of General Electric's Service Shops department.

Phillips will be responsible primarily for measurement of the national repair market and identification of new markets. His area of interest will include all of the department's 54 service shops which are located in key industrial cities throughout the nation. He joined General Electric in Schenectady in 1945.

Allis-Chalmers Lists Four Personnel Changes

Henry Larsen has been appointed assistant general works manager, Tractor Group, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. He succeeds Owen J. Higgins who was recently appointed general manager of the Harvey, Ill., Works.

Henry Larsen

Thomas W. Metz has been appointed manager of the Mid-Atlantic Region of Allis-Chalmers Industries Group succeeding the late Frank R. Freyler. John L. Wiedey has been named manager of the Indianapolis district succeeding Metz.

W. M. O'Connor has been appointed manager of the Amarillo district of Allis-Chalmers Industries Group.

Union Switch & Signal Announces New Sales Engineer

Announcement of the appointment of John T. H. Steel as a sales engineer in the General Apparatus Sales department of Union Switch & Signal-Division of Westinghouse Air Brake Company has been made. Steel was employed by Union Switch & Signal as a junior engineer in the Pipe Line Control Systems section, a position he held until his recent promotion.

Norheimer Elected Treasurer of New Production-Inventory Control Group

Louis Norheimer, production control manager of Tube Turns, Louisville, Ky., has been elected treasurer pro tem of the newly established American Production and Inventory Control Society. Tube Turns is a division of National Cylinder Gas Company.

The American Production and Inventory Control Society was recently organized at a meeting of industrial executive in Cleveland. Nyles Reinfeld, of the National Institute of Management, Inc served as temporary chairman.

Other pro tem officers of APICS a president, M. W. Maddox of the Muell Brass Company, Port Huron, Mich.; vic president, R. E. Carruth of the Acushn Process Company, New Bedford, Mass and secretary, Don Burkhart of th Haynes Stellite Corporation, Kokomo, In

Polyken Presents "100-Mile" Plaque To American Louisiana Pipe Line Co.

Polyken Sales Division of The Kendall Company recently made a plaque presentation to the American Louisiana Pipe Line Company. This recognition was for contributions made to "Big Inch" pipe line progress through the company's first use of the Polyken Protective Tape Coating Method on 100 miles of pipe line construction.

Willys Names Beattie Western Sales Chief

James J. Beattie, Jr., Eastern division manager of Willys Motors, Inc., has been appointed manager of the Western division with headquarters at San Francisco. Beattie succeeds Howard P. Grove who is taking an extended leave of absence.

Succeeding Beattie as Eastern division manager with headquarters in New York City is C. M. Ritchey, who has been Willys zone manager in Pittsburgh. With Willys since 1953, Ritchey was zone manager in Kansas City before assuming the Pittsburgh post two years ago.

Beattie has been with Willys since 1949 and became Eastern division manager in 1953 after three years service as manager of the Minneapolis sales area.

Houston Coating Company Begins Expansion Program

An expansion program for Tube-Kote, Incorporated, Houston, has been announced.

The most immediate project will be the construction of a 40 by 80-foot structure, to be built by the Metallic Building Company, which will house a 16 by 25-foot oven for tank coating work.

The company's plant is on Holmes Road.

Atlas Powder Company Makes Board and Officer Changes

Atlas Powder Company's directors have effected several changes in the board and officers of the company. Preston W. Parvis secretary and treasurer, was elected a director. He succeeds William J. Wiley, who has resigned as a director and financial vice president.

D. J. Carroll Copps and Edward J Goett, now vice presidents, were designated senior vice presidents. Robert J. Reilly presently director of the Economic Evaluation department, was also elected a assistant treasurer.

The Atlas executive committee now wil

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Proven systems for external or internal protection of...

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In every phase of the oil and gas industry, Copon Coatings are doing a job reducing corrosion losses. But in many instances, they are accomplishing even more.

Gas transmission companies report smooth, durable Copon Internal Pipe Coatings provide extra dividends of increased thru-put, cleaner delivery and reduced pigging costs. Installations at pumping plants and refineries prove Copon External Tank Coatings stay dazzling white despite exposure to severe atmospheric conditions, chemical fumes and spillage.

Copon Coatings, and systems for coating underground pipe lines in place or individual joints for new construction, have been developed in close cooperation with leading corrosion engineers. A complete technical service is available. Write today for help with your specific problem.

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EARLY craftsmen attested the purity of their products by stamping their individual hallmark on them.

We, too, affix our hallmark of quality coating and wrapping to the kraft wrapper of your pipe to assure you that it has been coated and wrapped according to procedures that establish the highest standard of quality for pipe protection.

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have the following members: Ralph K. Gottshall, chairman, Charles C. Gammons, and Copps and Goett. Gottshall is president and Gammons is a vice president and general counsel.

John H. Leary had been appointed assistant to the president. Leary previously had been assistant to the financial vice president.

Charles G. Cooper

Ralph A. Boyer

Cooper and Boyer Promoted To President, Vice-President

The election of Charles G. Cooper to president of Cooper-Bessemer International has been announced. In addition to his new capacity, Cooper is also president of Cooper-Bessemer Overseas Corporation and Cooper-Bessemer of Canada, Ltd. He succeeds Michael C. Pollock who has headed these three corporations for several years and who is now retiring from active service.

Ralph L. Boyer has been elected vice president and director of engineering. Boyer's election fills the position left open by the retirement of Hewitt A. Gehres.

A-C Construction Machinery Expands Sales Department

Expansion of the Sales department, Construction Machinery division, Allis-Chalmers Mfg. Company, has been affected by the creation of a new department within sales.

V. M. Holloway, assistant sales manager of the division will head this department, which will devote its full time to growth development of dealers and their sales organization.

J. M. Haile, who has been eastern territory manager of the division, has been promoted to assistant sales manager. K. A. New succeeds Haile as eastern territory manager.

A. O. Smith Corporation Increases Sales Districts

The A. O. Smith Corporation's Welding Products division has increased the number of its sales districts. L. G. Crowley continues to manage the Milwaukee area sales force. Sales personnel in the newly created Chicago and Detroit districts now report to W. P. Finneran and A. M. Brinson, former sales representatives in those cities.

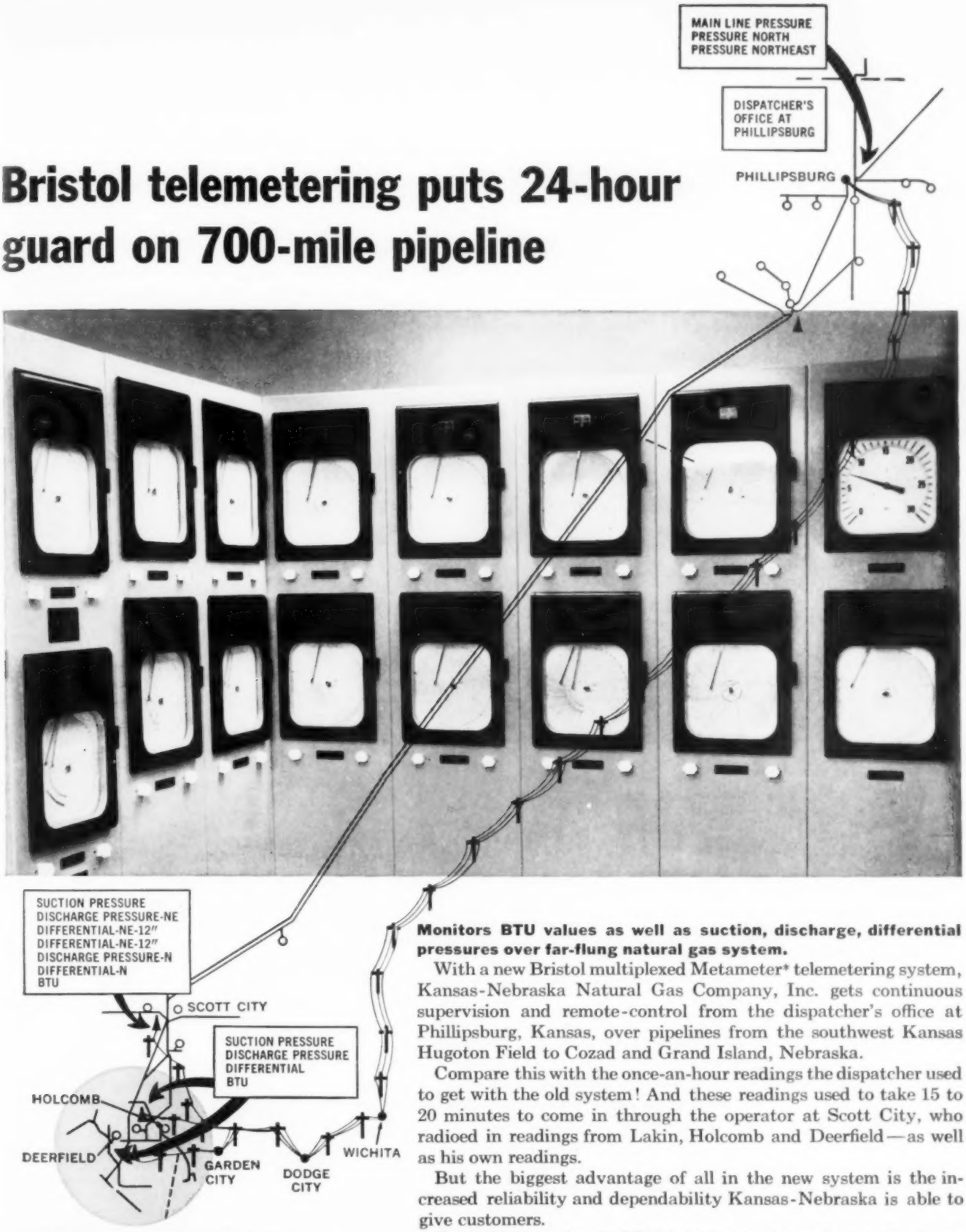
Bristol Company Completes New District Office, Factory

The Pittsburgh, Penn., district office of The Bristol Company has recently moved into a new building at 2250 Noblestown Road. The new building will house the sales and service staffs for Bristol's industrial instruments for recording, controlling and telemetering. District manager at Pittsburgh is L. B. Lumpkin.

A new branch factory and repair laboratory for Bristol instruments has recently opened in Houston. The new facility, at 3617 West Alabama, will be under the

For more data on advertised products, use Readers' Service Cards, last page.

Bristol telemetering puts 24-hour guard on 700-mile pipeline



BRISTOL METAMETER* RECEIVERS (*photo, above*) at Kansas-Nebraska Natural Gas Company's Phillipsburg, Kansas, office give gas dispatcher complete data from field and compressor stations miles away—including suction, discharge, differential pressures and BTU values. Map shows telemetering system from southwest Kansas field to Phillipsburg. Pipelines serve Cozad and Grand Island, Nebraska (not shown).

Monitors BTU values as well as suction, discharge, differential pressures over far-flung natural gas system.

With a new Bristol multiplexed Metameter* telemetering system, Kansas-Nebraska Natural Gas Company, Inc. gets continuous supervision and remote-control from the dispatcher's office at Phillipsburg, Kansas, over pipelines from the southwest Kansas Hugoton Field to Cozad and Grand Island, Nebraska.

Compare this with the once-an-hour readings the dispatcher used to get with the old system! And these readings used to take 15 to 20 minutes to come in through the operator at Scott City, who radioed in readings from Lakin, Holcomb and Deerfield—as well as his own readings.

But the biggest advantage of all in the new system is the increased reliability and dependability Kansas-Nebraska is able to give customers.

Find out how advanced Bristol telemetering and centralized control systems can step up service and reduce costs on your pipeline. Write: The Bristol Company, 114 Bristol Rd., Waterbury 20, Conn.

*T. M. Reg U. S. Pat. Off.

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BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

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SAFETY CONTROLS

For

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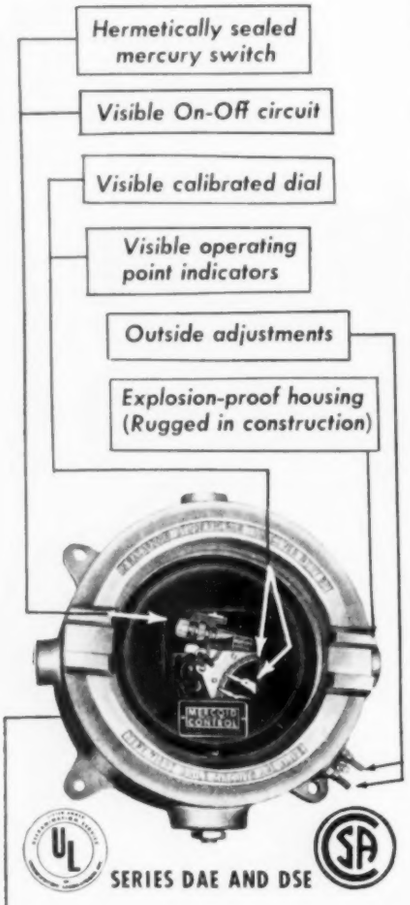

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Mercoid Controls are available in steel cabinets made to your specifications.

Built to last the life of the equipment it serves

Our engineers are at your service —send in your control problem.

THE MERCOID CORPORATION
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management of E. A. Merwin, Bristol's district manager in the Houston area since 1945.

Dresser's new Wellsboro plant.

Dresser Manufacturing Opens Compression Fitting Plant

Dresser Manufacturing Division of Dresser Industries, Inc., announces the completion of a new compression fitting plant in Wellsboro, Penn.

The new plant, providing 100,000 square feet of manufacturing space, is devoted exclusively to the manufacture of compression fittings for use by equipment manufacturers.

Another phase of Dresser Manufacturing Division's expansion program is taking place at the Bradford plant which has been enlarged with an addition of 33,000 square feet of space.

Cooper-Bessemer Corporation Announces Two Appointments

Robert F. Lay has become vice president and assistant general manager of The Cooper-Bessemer Corporation. In his new capacity, Lay will be directly responsible for coordinating the operating groups of the company.

Grant C. Woodard has been promoted to the position of general sales manager. Woodard will be responsible for the sale of all company products, namely centrifugal and reciprocating compressors, diesel, gas and gas-diesel engines to domestic markets.

Timken Roller Bearing Gets New Warehouse Distributor

The Steel and Tube division of The Timken Roller Bearing Company has named the Vinson Steel and Aluminum Company as warehouse distributors for the Timken Company's alloy steel mechanical tubing in the Southwest. Vinson recently completed a new warehouse at 1211 Kress Street, Houston. They also operate a warehouse in Dallas. Sales force includes 27 outside and 15 inside salesmen, covering the states of Texas, New Mexico, Oklahoma and Louisiana.

Tracerlab, Inc., Adds Three To Sales and Advertising

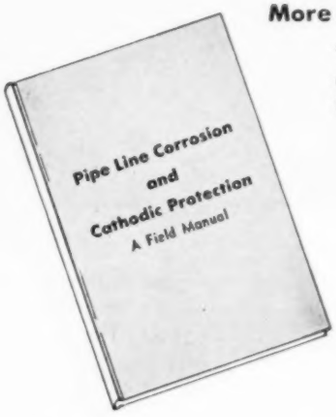
Tracerlab, Inc., has announced the addition of Charles B. Mead as a sales representative with headquarters offices in Detroit, Mich. The territory served by the Detroit offices is Michigan, Ohio and eastern Kentucky.

Joseph P. Beyer has also been named a sales representative with headquarters offices in Los Angeles and a territory covering southern California, Arizona, New Mexico, southern Nevada, Montana, Wyoming, eastern Idaho, Utah and El Paso, Texas.

Robert J. Allen has joined Tracerlab as assistant advertising manager.

More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."



Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

Send for your FREE copy of the New Petroleum Book Catalog which describes the nature and contents of many books pertaining to the Petroleum Industry.

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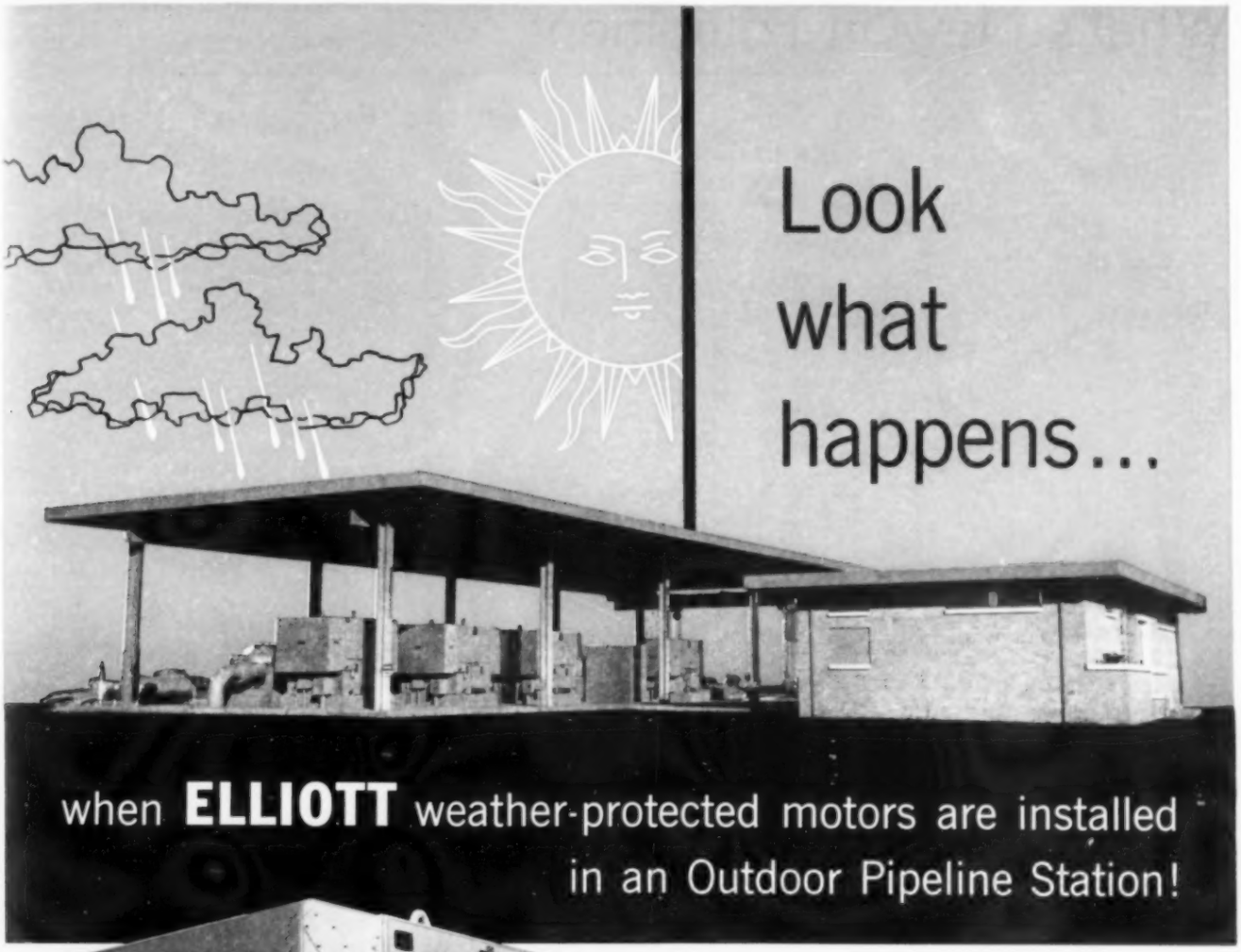
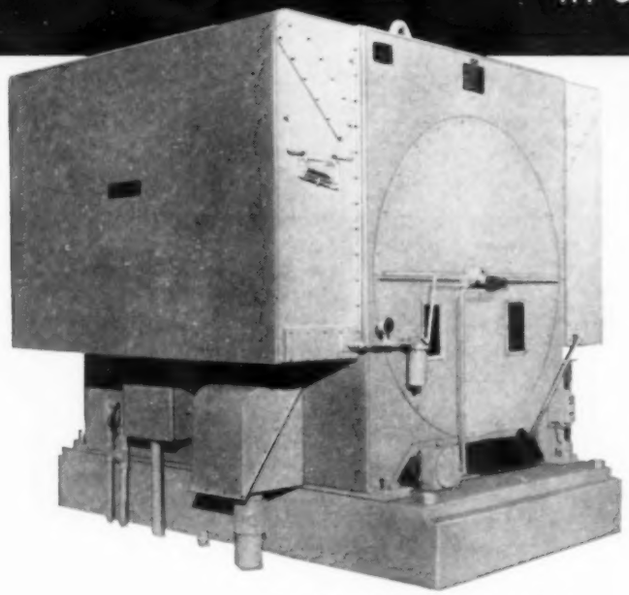
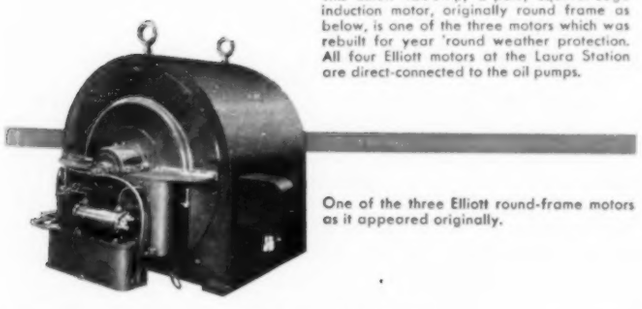


Look what happens...

when **ELLIOTT** weather-protected motors are installed in an Outdoor Pipeline Station!



This Elliott 1250-hp, 2-pole, squirrel-cage induction motor, originally round frame as below, is one of the three motors which was rebuilt for year 'round weather protection. All four Elliott motors at the Laura Station are direct-connected to the oil pumps.



One of the three Elliott round-frame motors as it appeared originally.

Costs Are Slashed. The outdoor structure costs far less and maintenance as well as year 'round operating costs are reduced. Besides that, Elliott motors are especially designed for safe, dependable, trouble-free operation *in all kinds of weather.*

Take the case of the Service Pipeline Company in Illinois. Rebuilding the above Laura Station as an outdoor facility, this company installed four Elliott weather-protected squirrel-cage induction motors. The station includes a canopy which gives extra protection from rain and sun—added insurance against the possibility of direct sunlight tripping the thermal devices, and provides a chain hoist for maintenance. Both the concrete slab area and the canopy extend far enough to provide ample working space around pumping units.

Three of the four motors, originally dripproof round-frame, were rebuilt to weather-protected designs—resulting in additional savings. Windings were given added treatment by immersing coil ends and baking. Explosion-proof bearing temperature and oil pressure relays were provided to assure maximum safety for operation in a hazardous atmosphere. These and other features of the Elliott weather-protected motors permit the erection of simplified outdoor stations instead of more costly enclosed housings. For further details, call your nearby Elliott District Office or write . . .

ELLIOTT Company

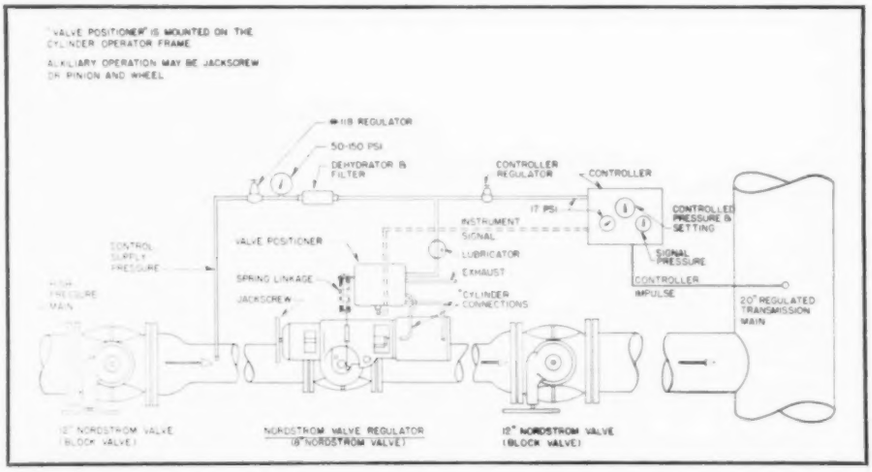
Ridgway Division • Ridgway, Pa.

R7-1

For more data on advertised products, use Readers' Service Cards, last page.

What's New in Equipment

for the Pipe Line Industry



Valve Regulator

A pneumatically controlled, cylinder-operated lubricated plug valve regulator, designed to provide high-pressure gas regulation with minimum pressure loss, has been developed by Rockwell Manufacturing Company. Features include operational ease and favorable flow characteristics of the lubricated plug valve, high capacity with low pressure loss, silent regulation and automatic pressure control. It is primarily designed for high-pressure, large-volume applications but is effective on services such as intermediate pressure control, back pressure relief and widely varying flows.

The new regulating device consists primarily of a cylinder-operated Rockwell-Nordstrom valve with a pneumatic pressure controller and valve positioner. It can be set up for either "fail open" (direct acting controller) or "fail closed" (reverse acting controller) operation.

(This item supplements Rockwell Manufacturing Company data on Pages 3805-3840 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Low-Voltage Switchboard

A low-voltage switchboard, built in standardized modules for application versatility, has been introduced by General Electric's Distribution Assemblies department. This switchboard is designed for any incoming service, 600 volts or less. Its mains are rated 800 through 4000 amperes.

The new switchboard is designated the Type DR Universal because the silver-plated structure and vertical bus bars are drilled to accommodate virtually any combination of seven different low-voltage protective devices. These seven protective devices are divided into three classes and include 1) circuit breakers—both molded-case breakers and large AK air circuit breakers; 2) circuit breaker, current-limiting fuse combinations, either the standard breaker with current-limiting fuses or the current-limiting, molded-case breaker with integrally mounted current-limiting fuses; and 3) fused interrupter switches including the GE Type QMR interrupter switch, a non-automatic breaker with series fuses and the GE Type LB-1 service protector.

The mains of the Type DR switchboard consist of bus bars mounted horizontally in the center of each section. Two separate vertical bus structures in each section are center-fed from this main horizontal bus, thus leaving the top and bottom areas free for incoming busway or cable.

(This item supplements General Electric data on Pages 2019-2020 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

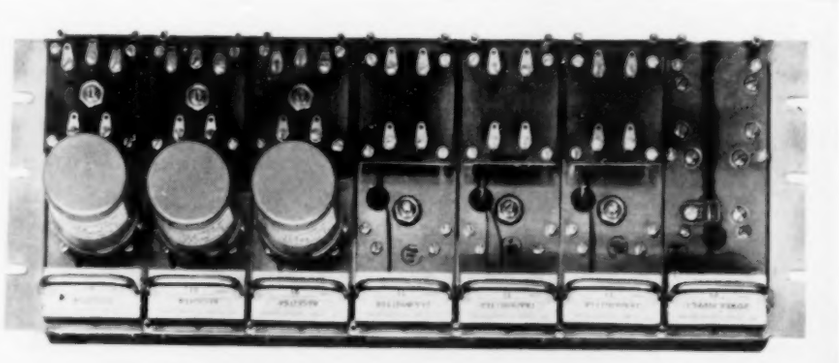
Gasketing Materials

Five high density fiber gasketing materials which make it possible to obtain seals at lower flange pressures have been developed by the Armstrong Cork Company's Industrial division. The new materials are an addition to the Company's Accopac series, a recently developed group of gasketing materials that have more flexibility, dimensional stability and uniformity than conventional fiber gaskets.

In the unique manufacturing process, the fibers are uniformly coated with a synthetic rubber saturant while still dispersed in water. In manufacturing these five new additions to the line, the materials are "pre-compressed," or compressed to a higher density by an extra calendering operation, thus closing the natural voids in the material so that seals can be obtained under relatively low flange pressures.

Armstrong now has 15 Accopac gasketing materials for applications having flange pressures in excess of 800 pounds per square inch, for both low and high temperature applications.

For more data, circle **No. E3** on Readers' Service Card, last page this issue,



Transistor Telemeter

A new type of transistor tone telemeter developed by the Warren Manufacturing Company, Inc., has demonstrated improvement in system reliability for remote metering and control applications at a greatly reduced unit price. Designated the TTl, this tubeless 18-channel system has sharply notched bandpass filtering which permits allocation of tone channels 120 cycles apart. Noise, harmonic and intermodulation rejection characteristics are featured. Tone signals may be applied simultaneously as a composite signal to any private open wire, cable, radio or microwave system, hence multiplying telemetering circuits.

The equipment employs PNP junction type transistor tone oscillator transmitters operating in 18 frequency channels between 420 and 2460 cps. These transmitters are keyed independently by any circuit closure end device and the pulsed tone output applied to a single transmission medium on a frequency multiplexed basis. At the receiving location each tone is selectively received by TTl receivers.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

HOW BELL SYSTEM COMMUNICATIONS SERVE THE PIPELINE INDUSTRY

"Our dispatching control is more efficient now that our stations are remotely controlled"

—W. H. Krammes, superintendent of central transmission, Southern California Gas Co.

Bell System remote metering and control channels have enabled Southern California Gas to convert many distribution stations to remote operation. Dispatching control is now more efficient than before the conversion was made.

"To supply a big area like Los Angeles, you have to react fast in case of a load change or pressure drop," says W. H. Krammes, chief of central transmission.

"When our stations were attended, we'd often have a ten-minute lag between a dispatcher's order and its execution. The station attendant would have to run back and forth checking meters, then relay the readings to the dispatcher.

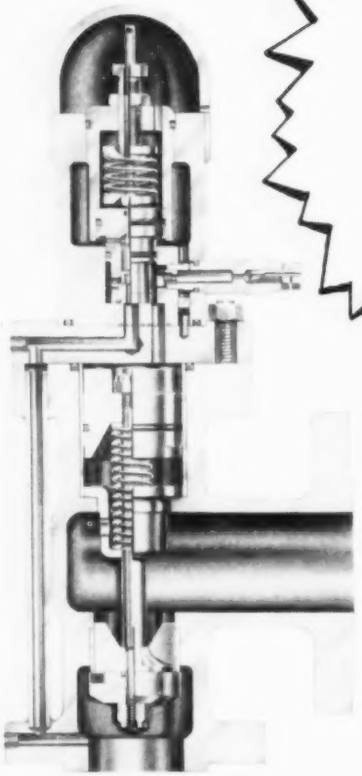
"Today, with Bell System channels for remote metering and control, it's practically instantaneous. The dispatcher reads the telemeter, pushes a button and valves are operated at the remote station."

If your operation requires tight control, you'll be interested in communications the Bell System has developed for this job. Just call your Bell Telephone Company business office. A representative will gladly study your requirements.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER • DATA TRANSMISSION SYSTEMS
CHANNELS FOR: REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

INSTANTANEOUS OPENING FOR GAS OVERPRESSURES



MODEL 416 RELIEF VALVE ASSURES POSITIVE PROTECTION

The new pilot operated Kinzbach Model 416 Relief Valves were designed to be the most dependable relief valve for gas services. Whenever line pressure reaches set pressure the pilot valve opens and full line pressure is applied to the main valve, opening it through its full stroke without pressure accumulation.

This flat-seated pilot valve has a stainless steel loading spring which makes possible an extremely accurate set pressure and years of trouble-free performance. Some other advantages of this simple and rugged valve include its positive leakproof seating, easy functional testing below set pressure, and convenient bench setting for both opening and closing pressure. The Model 416 Valves are Certified under A.S.M.E. Unfired Pressure Vessel Code (Sec. VIII, Par. UG-131).

For complete details on this and other Kinzbach Relief Valves, write for new catalog.

KINZBACH TOOL CO INC

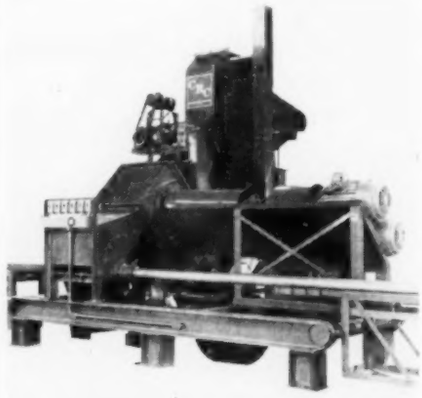
KINZBACH TOOL CO., INC.
P. O. Box 277 • Houston, Texas

EXPORT OFFICE:
74 TRINITY PLACE
NEW YORK, N. Y.

Pipe Tongs

Mathey Pipe Tongs which release pipe automatically have been announced by the C. A. Mathey Machine Works, Inc. Pipe is released automatically when weight is slacked off. Available in a complete range of standard pipe sizes from 4-inch to 36-inch, the 8-inch Mathey Tong illustrated was proven and thoroughly field tested on 800 miles of takeup, equivalent to 100,000 lifts and releases.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.



Pipe Cleaning Machine

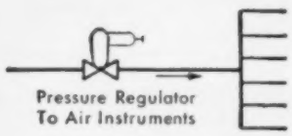
Crutcher-Rolfs-Cummings, Inc. is building grit-blast pipe cleaning machines for stationary yards. Termed the CRC Auto-Blast Pipe Cleaning Machines, they are capable of thoroughly cleaning pipe up to 90 lineal feet per minute in automatic succession.

Two models are available: ¾-inch to 12-inch pipe size and 6-inch to 36-inch pipe size. Industrial steel grit is blasted on the pipe surface at 14,000 feet per minute velocity in a controlled pattern. The Auto-Blast handles up to 2500 pounds of grit per minute. This high velocity abrasion removes rust and mill scale leaving the metal bare and warmed for primer application.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

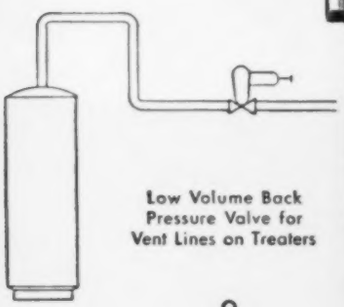
1st Choice FOR POUNDS TO POUNDS SERVICE

FISHER®

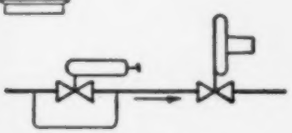


Pressure Regulator To Air Instruments

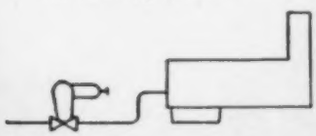
Pressure Regulator For High Pressure Gas Bulk Storage



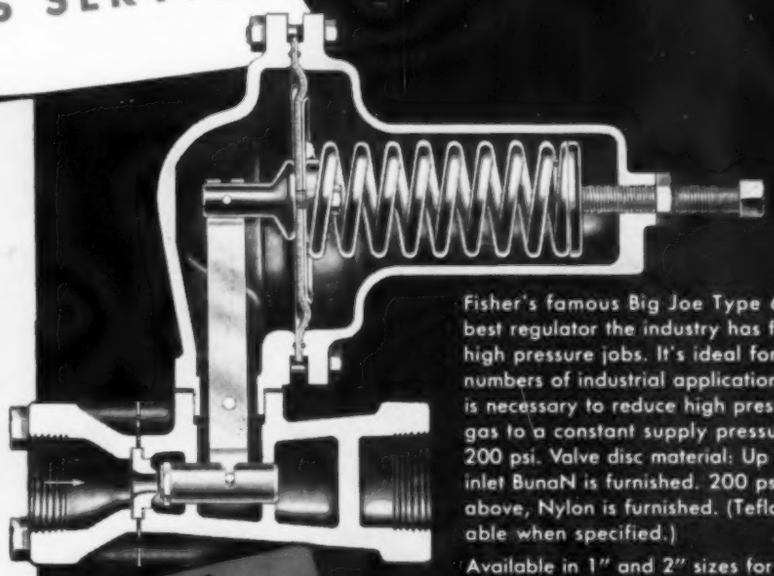
Low Volume Back Pressure Valve for Vent Lines on Treaters



Pressure Regulator For Farm Tap Service



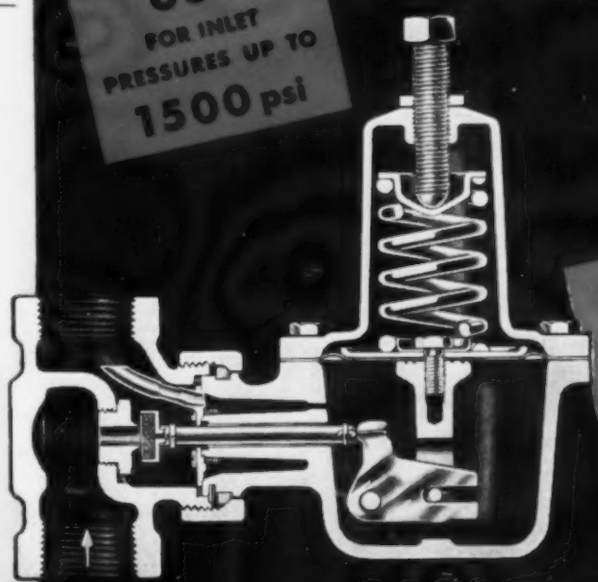
Reducing Valve for Heater Fuel or Treater Furnace Fuel



Fisher's famous Big Joe Type 630 is the best regulator the industry has for rugged high pressure jobs. It's ideal for countless numbers of industrial applications where it is necessary to reduce high pressure air or gas to a constant supply pressure of 5 to 200 psi. Valve disc material: Up to 200 psi inlet BunaN is furnished. 200 psi inlet and above, Nylon is furnished. (Teflon is available when specified.)

Available in 1" and 2" sizes for inlet pressures up to 1500 psi and outlet pressures 5 psi to 200 psi.

TYPE 630 FOR INLET PRESSURES UP TO 1500 psi



TYPE 620 FOR INLET PRESSURES UP TO 750 psi

For real economy the Fisher Type 620 pounds to pounds regulator is used on same applications as 630 "Big Joe" where pressure and flow requirements do not exceed 750 psi and reduced pressure not above 100 psi.

For inlet pressures up to 750 psi with malleable iron or cast steel body; up to 150 psi with cast iron body. Outlet pressure ranges: Type 620—3 to 60 lbs. (4 springs). Type 621—3 to 100 lbs. (5 springs). Valve disc material: BunaN when inlet pressure is 300 psi or less, and Nylon when inlet pressure exceeds 300 psi.

Sizes: ¾", 1" and 1¼" with cast iron or cast steel body. ¾" and 1" with malleable iron body.

FISHER GOVERNOR COMPANY
MARSHALLTOWN, IOWA
WOODSTOCK, ONTARIO

LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

FISHER Since 1880

Self-Propelled Crane

A 25-ton self-propelled crane has been added to the Lorain line of power shovels and cranes. This Model SP-425 needs only one man for operation since all controls for carrier as well as turntable operations are located at the operator's position in the cab.

Other new features offered as standard equipment are the "Shear-Ball" mounting that eliminates all types of turntable rollers, center pins and centering gudgeons and a 30-foot pin-connected crane boom of alloy steel of the new Lorain square-tubular-chord design for increased lifting capacities and longer ranges at reduced weight. Also available are two-lever, "Joy Stick" controls for air-power operation of all turntable clutch operations.

The 6 by 4 carrier, specially designed for heavy-duty self-propelled service utilizes a heavy-duty, spring-mounted front axle of tubular design and provides for non-scuff, dual front wheels of the differential type. It has four travel speeds in both directions.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.

Chemical Injector

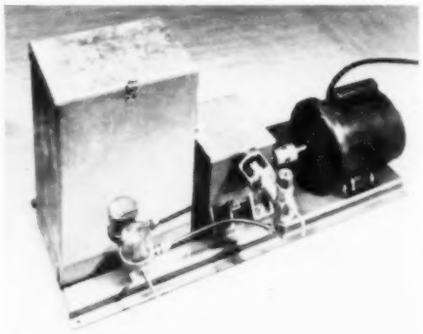
A precision flow-control, SAC 4000 Series mechanically driven chemical injector has been announced by the Texstream Corporation. Light weight, rugged construction and compact design are featured. The standard power source for the SAC 4000 Series injector is a ¼ horsepower, 1750 revolutions per minute, constant speed motor.

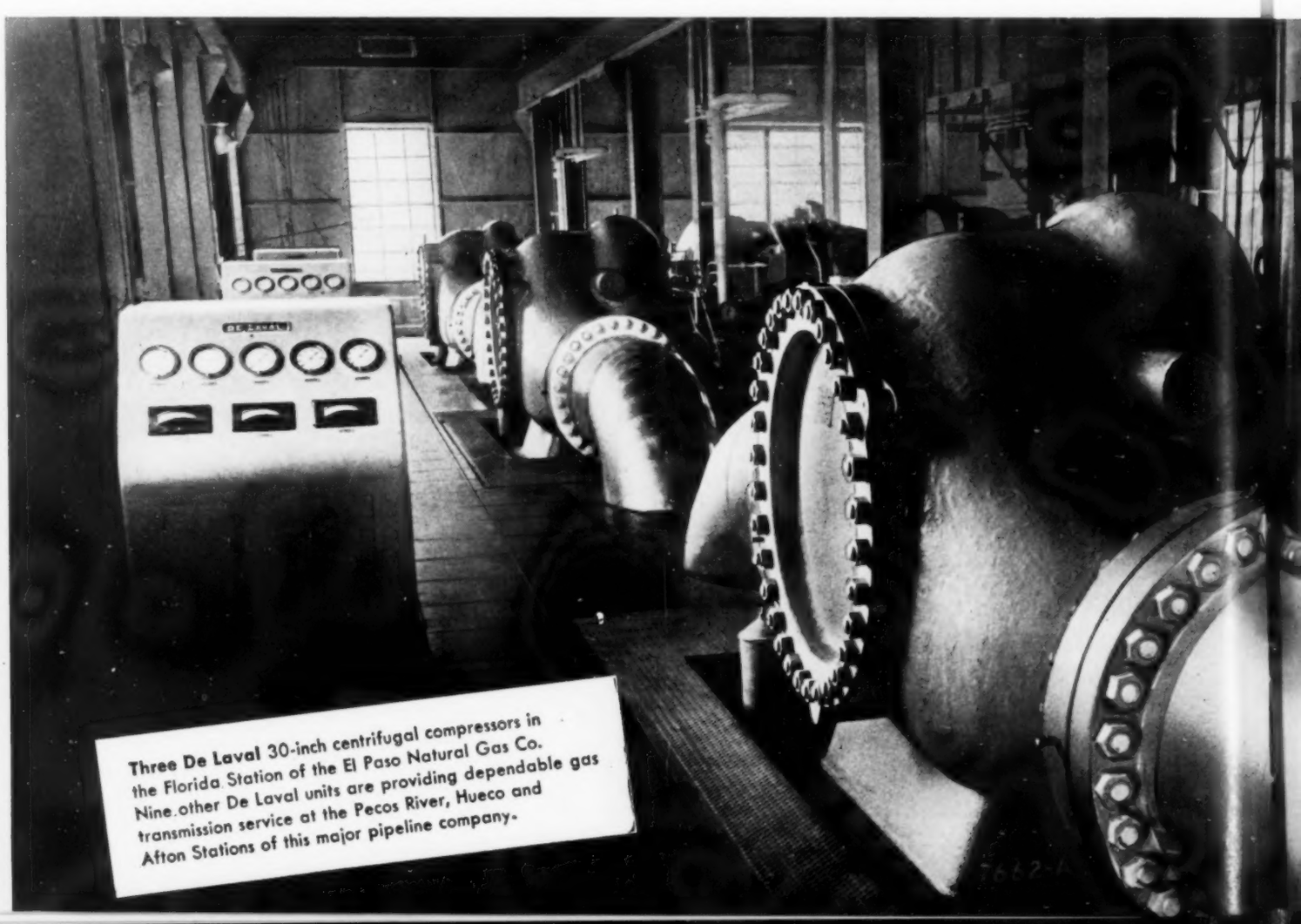
Power is transmitted from the prime mover, through a ½-inch drive shaft fitted with a flexible coupling. A 50 to 1 reduction element, consisting of a worm gear-eccentric assembly, motivates a crosshead driving one or two independently adjustable plunger shafts.

The standard SAC 4000 series injector head is machined from Meehanite and delivers injection pressures of 1200, 500 and 250 psi when equipped with ¼, ⅜ and ½-inch plungers respectively. Plunger stroke length and diameter control permits a wide variation of fluid delivery rates ranging from micro volumes to a maximum of 40 gallons per day.

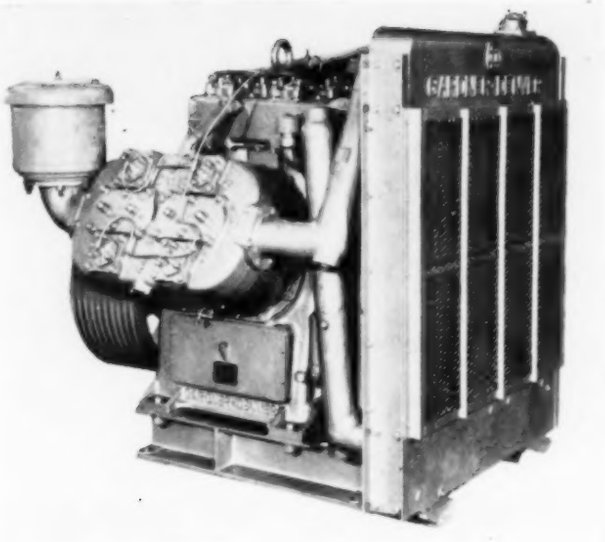
(This item supplements Texstream Corporation data on Pages 5038-5043 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E8** on Readers' Service Card, last page this issue.





Three De Laval 30-inch centrifugal compressors in the Florida Station of the El Paso Natural Gas Co. Nine other De Laval units are providing dependable gas transmission service at the Pecos River, Hueco and Afton Stations of this major pipeline company.



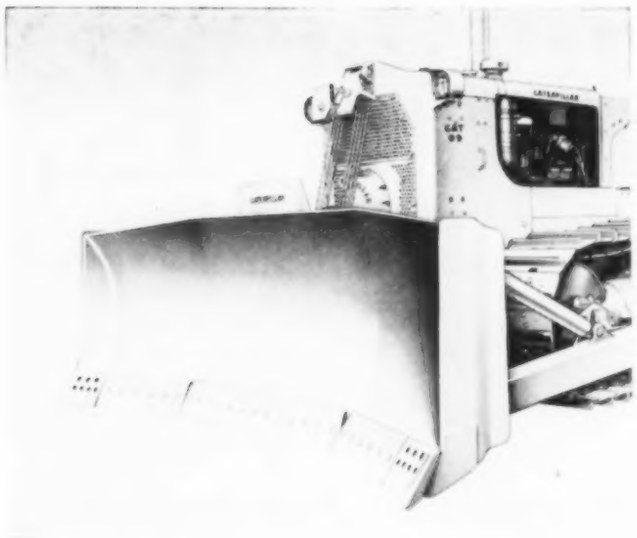
Compressor Unit

Gardner-Denver Company recently announced the addition of a new, high-capacity unit to its established WB line of air compressors. Designed to save floor space, the Model WBN is a 200 horsepower, two-stage packaged unit occupying only 34 square feet of space.

WBN unit needs no special base. All that is required for operations is to bolt it down and hook it up to its source of power. Once installed, it operates on long, steady runs with little attention. It is available with a tube-type intercooler or with a self-contained radiator-intercooler which saves on cooling water.

(This item supplements Gardner-Denver Company data on Pages 1945-1964 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E9** on Readers' Service Card, last page this issue.



Bulldozer

The No. 9U Bulldozer, a new tool for the Caterpillar D9 Tractor, was introduced recently by Caterpillar Tractor Co. Ideally suited for such jobs as stripping, pioneering and coal handling, the No. 9U Bulldozer's design allows it to retain large loads on long-distance moves. It is designed with a straight center section and two side sections angled forward. The side sections cast material inward and the straight center section pushes the material ahead of the blade, providing for a minimum of end spillage.

Overall width of the new tool is 14 feet, 10 inches and its weight is 12,496 pounds.

(This item supplements Caterpillar Tractor Company data on Pages 1210-1212 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. 10** on Readers' Service Card, last page this issue.

DE LAVAL

CENTRIFUGAL COMPRESSORS

on the job at El Paso Natural Gas

De Laval centrifugal compressors offer many important engineering features. (1) They are designed to handle an increased ultimate flow, can be quickly converted to larger capacities by replacing the impeller, diaphragm and a few minor parts. (2) The high pressure shaft seal eliminates leakage, consumption of sealing oil is negligible. (3) There is only one moving part—the rotor—which has ample clearance. (4) Units are compact, require smaller foundations and smaller stations. (5) First costs and installation costs are low.

Bulletin 503 gives data on De Laval Centrifugal Compressors. Write for your copy.

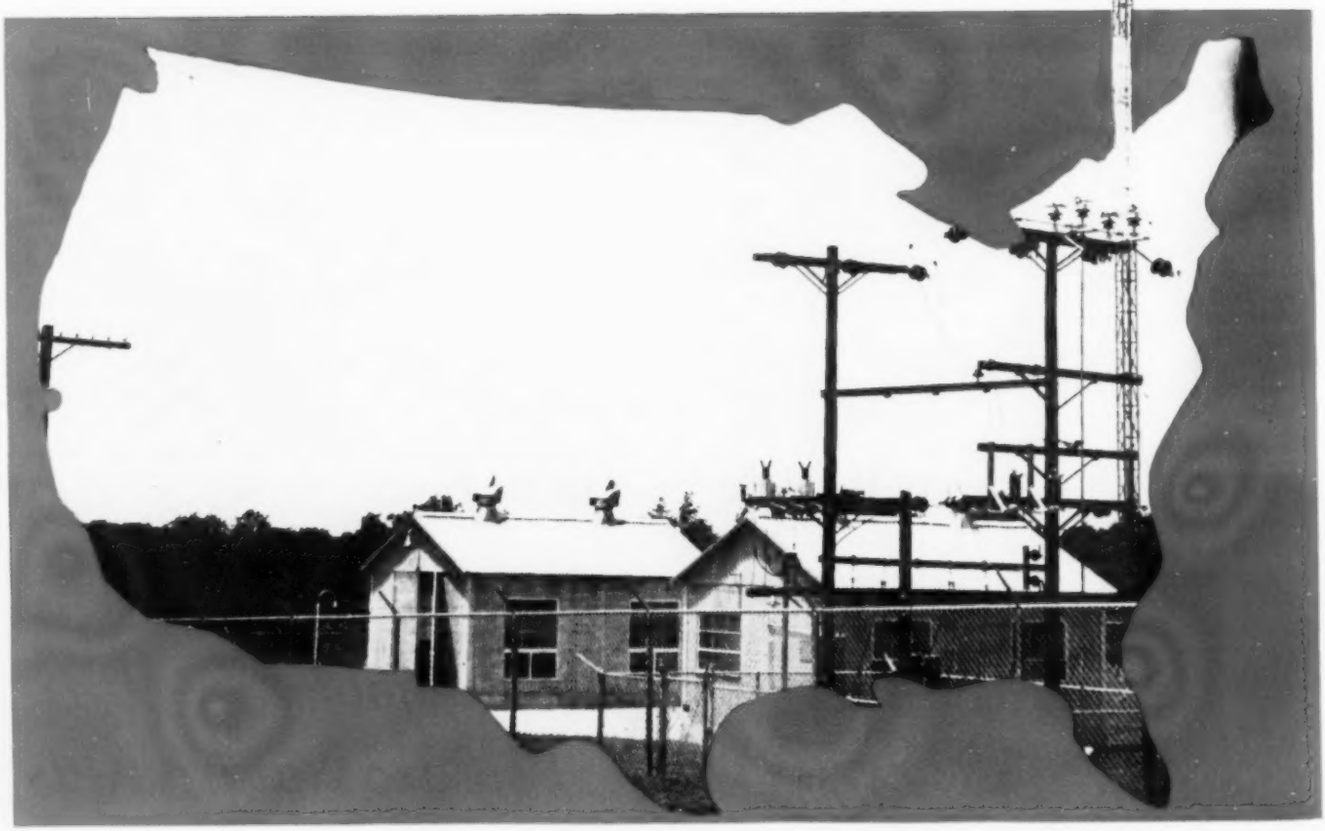
DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

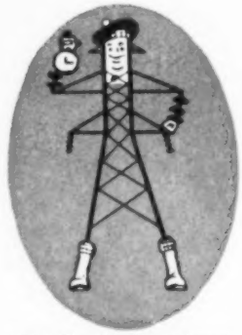
DL375

ELECTRIC POWERED MICROWAVE CONTROLLED PIPELINE STATIONS NOW SPAN AMERICA...



One of many ways progressive management puts UTILITY ELECTRIC POWER to work

If you are in the pipe line transmission business . . . or if you contemplate having anything to do with pipe line transmission operations, don't sign any contract for power until you have carefully investigated the advantages of UTILITY ELECTRIC POWER. Of the 686,000 miles of pipe line systems in America, a big percentage of these is operated by Electric Power. When you have deliveries to make – at low cost – do it the modern, progressive way. Use UTILITY ELECTRIC POWER.



I'M LCP – Low-Cost Power on the Job 24 Hours Daily

PETROLEUM ELECTRIC POWER ASSOCIATION
P. O. BOX 35006 DALLAS, TEXAS

Wheel Tractor

J. I. Case Company has introduced a new Model "320," first in a series of completely equipped wheel tractors designed and built for heavy-duty industrial use. The new tractor has distinctive recessed headlights, sturdy steel bumper and radiator guard. A fabricated steel wrap-around sub-frame protects the engine and transmission and supports mounted equipment.

The tractor is powered by a high-torque 148 cubic inch Case industrial engine. Power steering and a high-speed shuttle transmission are also available on the "320." The exclusive Case transmission enables the operator to go forward or back up without shifting gears.

Both front-end loader and backhoe are of stress-engineered box-welded steel plate construction.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.

Pipe Cutter

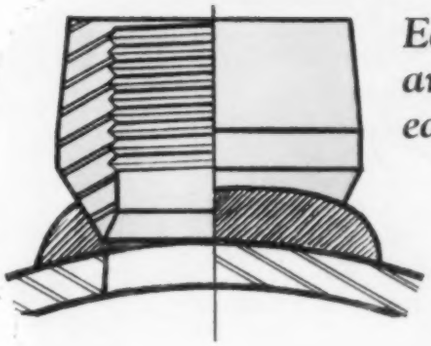
A lighter weight and smaller Spring Load pipe cutter for cutting of cast iron, Duriron, vitrified clay or concrete pipe on the job has been introduced by Spring Load Manufacturing Corporation. Designated the Number 4, the cutter has a size range of 1½ inches to 4 inches.

Its small size and 4½-pound weight make it as convenient to use and carry as a pipe wrench and especially handy for cutting in close quarters.

For more data, circle **No. E12** on Readers' Service Card, last page this issue.

A New Line of Branch Connections

W-S COUPLETS



Economical and easy-to-install

Readily modified for small diameter installation

W-S Couplets are designed to function as universal outlet connections for tanks, process vessels and pipelines. They eliminate the need for large, expensive field inventories and costly delays in fabrication.

On most tank, and large piping installations they are used as received. On those few applications where attachment is to be made to a small diameter pipe, the W-S Couplet is easily modified by contouring the welding end with an acetylene torch to mate with the curvature of the pipe diameter. Couplets are made with extra length and heavy wall to permit contouring without detriment to the threaded or socket end.

W-S Couplets are available in sizes ¼" through 2", with screw-end or socket-welding dimensions . . . also in a 90° elbow.

Send for Bulletin CP-1-57. Write to W-S Fittings Division, H. K. Porter Company, Inc., P. O. Box 95, Roselle, N. J.

HKP **W-S FITTINGS DIVISION**
H. K. PORTER COMPANY, INC.

For more data on advertised products, use Readers' Service Cards, last page.

Transistorized Power

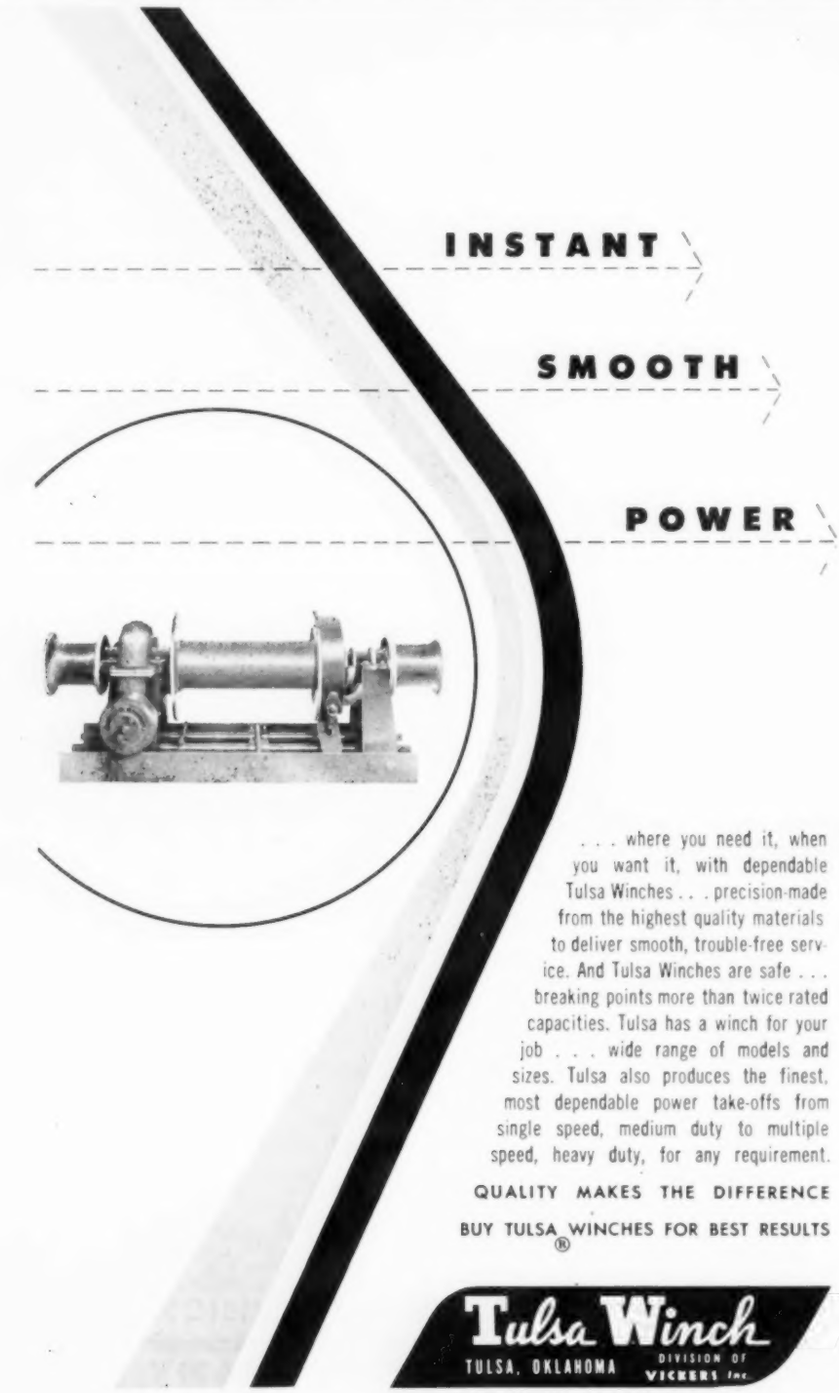
A newly developed transistorized power supply designed to provide greater reliability in two-way radio communication equipment has been announced by the General Electric Communication Products department. The unit replaces the receiver portion of the mobile power supply, and, with life expectancy equal to that of an entire mobile combination, will help accomplish cost reductions in maintenance.

Designed around a printed wiring board, the unit measures 3½ inches wire, 4 inches long and 1¾ inches deep.

The transistorized power supply will be marketed as optional equipment for Progress Line 12-volt d-c receivers. It may be used with any standard make of mobile equipment using a 12-volt power source in the 25-54 mc, 144-174 mc and 450-470 mc bands.

(This item supplements General Electric data on Pages 2019-2020 of the Composite Catalog, 22nd Edition.)

For more data, circle **No. E13** on Readers' Service Card, last page this issue.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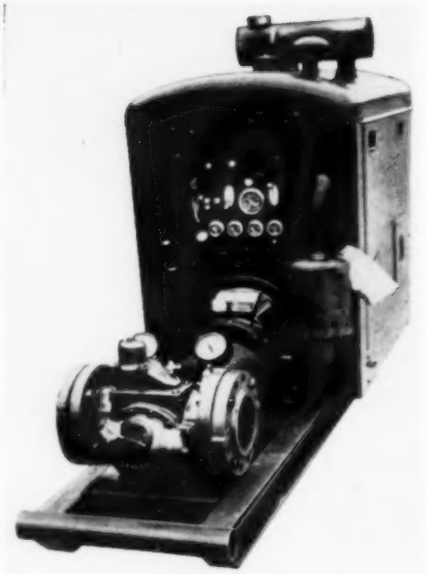


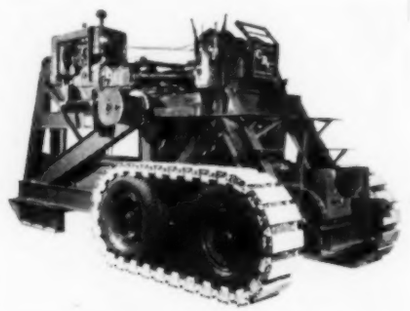
Rotary PD Pump

A six-inch Granco rotary positive displacement flanged pump is now being manufactured by Granberg Corporation. The new model handles capacities up to 225 gyrations per minute for hot asphalts and up to 350 gyrations per minute for gasolines and fuel oils.

The pump can be powered by gasoline engine, as shown, or by other power as required.

The six-inch pump is available in steel or cast iron construction. The steel models for hot asphalts and other viscous products will operate at temperatures up to 600° F. Cast iron models are for gasolines and other lighter products. Both models operate at pressures up to 70 pounds per square inch.

For more data, circle **No. E14** on Readers' Service Card, last page this issue.



Vertical Pipe Bender

Crutcher-Rolfs-Cummings, Inc. has announced the manufacture of a new vertical pipe bender. The bender, Model "B," is more powerful than its predecessors, yet takes up less room because it is under eight feet wide. It contains the new tandem-axle, pneumatic mounting for increased mobility. Rubber tires or Athey Tracks are optional and detachable track pads are available for fitting over the tires.

The benders will be built in three sizes to handle up to 20, 30 and 36-inch pipe. More bending power is attained and bending speed is increased by large, needle-bearing, mounted cable sheaves and a tilted front mast to give a stronger vertical bend pull.

For more data, circle **No. E15** on Readers' Service Card, last page this issue.

WHY NOT LET BrakeSolve YOUR PARAFFIN Problem?

BRAKESOL is the safe, economical way to clean up and control paraffin in your production system. By using BRAKESOL, you get more production, by reason of having unrestricted flow and by avoiding those tank bottoms.

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BRAKESOL is non-corrosive and will not harm production or refinery equipment.

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Wayne A. Johnson, president, and his associates in Corrosion Rectifying Company, Inc., are well-known corrosion prevention specialists with offices in Houston. Their work is concentrated on designing and installing corrosion rectifying systems for pipelines, refineries and oil producing companies.

Here, in convenient reference form, are timely articles on corrosion prevention systems by a well-known specialist in the field. Send for your free copies, giving name, company and title.

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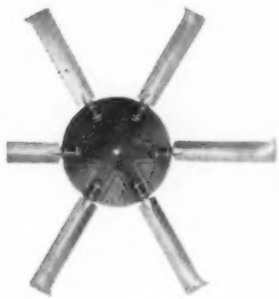


- Sizes 14' to 18'
- 4 or 6 blades

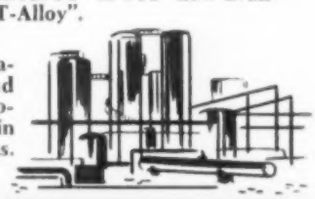
Developed originally for the petroleum industry, Aerovent Large-Diameter "Al-metal" Propellers, constructed of tough, durable aluminum alloy, move great quantities of air at high velocities, in heat exchangers and cooling towers. Pictured above are two 4-blade, 16-ft. propellers in a cooling tower installation. These mighty propellers, with adjustable-pitch "Macheta" Airfoil blades, are job-engineered to individual specifications.

Write for free Bulletin 510

DESIGNED FOR DEPENDABLE OPERATION!

Endurance tests, conducted at *3 times* normal loading prove the ability of these new large-diameter propellers to withstand severe punishment. Heavy-duty cast steel hubs offer maximum resistance to stresses. Angle settings for each operating requirement, and appropriate alternate settings, assure accurate pitch for any predetermined performance which may be required. 54" to 144" now available in revolutionary new "T-Alloy".

REFINERIES, pumping stations, industrial plants and commercial buildings use Aerovent "Al-metal" Propellers in major air-moving applications.



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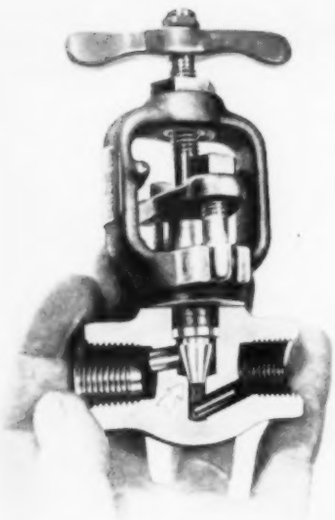

Instrument Valves

Welding advantages of carbon steel and seat wear characteristics at least equal to stainless steel are combined in the high temperature instrument valves recently introduced by Edward Valves, Inc., subsidiary of Rockwell Manufacturing Company. The body of the valve is carbon steel and can be welded into carbon steel pipe lines with ease. Wearing qualities are improved by incorporation of an integral seat insert of chrome- cobalt- tungsten alloy (arrow).

Rated at 2500 pounds at 850° F., the new valves have drop forged steel bodies and yokes and swing bolted glands for easy repacking. Precise flow control required for power plant instrumentation and similar applications is provided by a tapered needle point stem disk and fine pitch screw threads.

(This item supplements Edward Valves, Inc., data on pages 1606-1609 of the Composite Catalog, 22nd Edition.)

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Lift Truck

Allis-Chalmers Manufacturing Company has started production on a new 10,000-pound capacity lift truck, the FT-100. The truck is designed for heavy duty work where heavy loads have to be handled. The welded industrial-type frame assures complete alignment of parts and low maintenance. The 230 cubic inch engine, available in diesel, gasoline or LP gas fuel models, provides high torque at normal engine speed. A roller type "extra lift" mast that gives more lift without increasing the overall lowered height of the unit is available in three standard heights.

Other features include a two-speed, constant mesh transmission with power shift transmission, power steering and a No-Spin Differential available as optional equipment.

(This item supplements Allis-Chalmers Manufacturing Company data on pages 169-176 of the Composite Catalog, 22nd Edition.)

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Speeds cross-country pipelines

Take another look at this big, wheel-type ditcher. It's a new addition to Parsons line — the Middle-Inch 420. With it, you get trench widths from 31 to 46 inches, and depths to 7½ feet. A wide range of digging speeds from 5.8 inches up to 44 lineal feet per minute assures maximum trench production at every width, depth, in all materials. Here's more news that will interest you —

A Big-Inch 520

Rounding out a complete line of *Trenchliners for pipeliners*, Parsons also brings you a Big-Inch 520! It digs up to 8½ feet deep, 40 to 52 inches wide, at speeds up to 28 feet per minute. Both of these big, wheel-type Inchers are job-proved. They were originally developed by C-R-C, and now built by Parsons — bringing you the *combined* engineering know-how and services of both firms. Other Trenchliners include several sizes of wheel, and ladder types on rubber or crawlers.

PARSONS COMPANY, Division of Koehring

For laterals, gathering lines, etc., Parsons offers smaller wheel-types. For example — the new 170, with wide wheel frame, digs 20 to 32 inches wide, 5¾ feet deep. It has hydraulic wheel-hoist on power-tilt mast. Conveyor is hydraulically driven — belt speeds are completely independent of digging wheel speeds.

WANT MORE FACTS?

PARSONS Company, Newton, Iowa

Send us literature on: ☐ 420 Middle-Inch ☐ 520 Big-Inch ☐ 170 Trenchliner

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Here's the Fast Easy Way to Anchor Pipelines

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Chance Pipe Line Screw Anchors and Brackets greatly simplify pipe line anchoring, compared to other methods, and save many dollars in pipe line construction.

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Can be installed in the ditch without extra digging.

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New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Payscraper

Engineering developments on the Model 55 Payscraper are described in an eight-page booklet released by International Harvester Company. The pamphlet describes the better design advantages of the 14 cubic yard self-propelled scraper and illustrates such features as the improved bowl, three-piece reversible cutting blades and "flow system" of positive power steering. Brief specifications of the various components of the unit are also included.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Film Stories

Allis-Chalmers Manufacturing Company has issued two bulletins telling the stories of two films previously made available. The booklets tell the story of the 20-minute films, "How to Make a Motor Go . . . and Go, and Go, and Go," and "How to Take Step Seven." The films are available for viewing from Allis-Chalmers nearest Industries Group office.

To get a copy, circle **No. 819** on Readers' Service Card, last page this issue.

Gate Valves

Illustrated in color, a 12-page bulletin describes Grove Series G-4 fabricated steel Seal-O-Ring Pipeline Gate Valves for 6 to 36-inch lines, ASA series 150 to 600, WOG. Prepared as an engineering and specification reference, the booklet contains complete dimensional tables; charts and graphs to determine venturi valve flow rates and gas flow correction for gravity, temperature and supercompressibility as well as photos and drawings of design details and operational features.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.

Centrifugal Pumps

Ingersoll-Rand's Class GT general purpose, centrifugal pumps are covered in a 16-page, two-color pamphlet now available. The bulletin tells in detail of the many advantages of the Class GT pump. It also incorporates cross-sectional drawings, installation views, selection charts and dimension tables.

To get a copy, circle **No. E21** on Readers' Service Card, last page this issue.

Motor Starters

Allis-Chalmers' complete line of motor starters and contactors in sizes 4, 5 and 6 (Type 425), 50 to 400 horsepower, is described in a 12-page bulletin. The various types of starters and contactors as well as their design are described and illustrated.

To get a copy, circle **No. E22** on Readers' Service Card, last page this issue.

Concrete Weights

Anchor-Wate Company has published a 12-page brochure covering patented concrete weights for pipe line use and concrete weighting material application. The publication also includes illustrations of facilities available for concrete weighting of all types of pipe lines and tables of interest to engineers.

To get a copy, circle **No. E23** on Readers' Service Card, last page this issue.

Tank Gage

The Johnston & Jennings Company, Oceco Division, has recently made available a new bulletin giving full details of the construction and operation of their new No. 30 Tank Gage. The No. 30 Tank Gage is completely automatic, easy to read and readily adapted to remote reading.

To get a copy, circle **No. E24** on Readers' Service Card, last page this issue.

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Manufactured in new, modern, continuous mills to exceed specification ASTM-A139-55 Grade B. Available with belled ends, plain or asphalt coated. Butt welded using inert gas, electric welding processes. Pressure tested. Ideal for use in petroleum, gas, and water systems, as well as for irrigation, heat exchangers, well casing and other farm and industrial uses.

Available in 6", 6⅝", 8", 8⅝", 10", 10¾" diameters: 10, 12, 14 and 16 gauge; 20, 30 or 40 ft. standard lengths, or can be produced in any odd size desired.

Available for immediate delivery.

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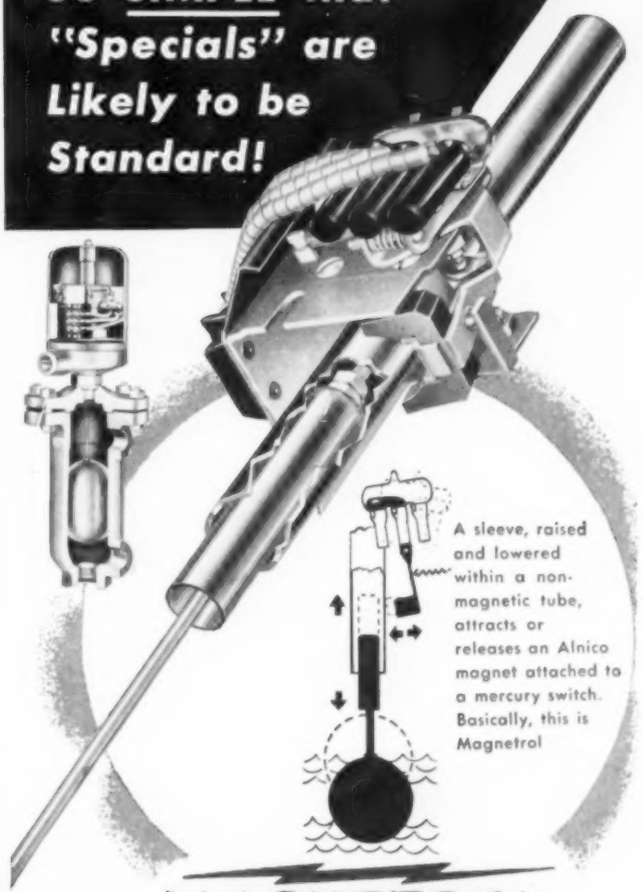
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Magnetrol is so simple that failure is all but impossible! Using only permanent, unfailing magnetic force for its operation, there's nothing to wear out . . . no diaphragms or bellows to stiffen and rupture . . . no electrodes to short or corrode . . . no packing to bind or leak. Magnetrol is practically maintenance-free! Magnetrol units are available for controlling level changes from .0025-in. to 150-ft. . . . with multi-stage switching when desired. Send coupon for full details.

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Designed and built at Cowley, the six-wheeled chassis is powered by a Gardner 5 L.W. oil engine, giving 94 b.h.p. at 1,700 r.p.m.

There is a separate power unit (Gardner 4 L.W.) for turntable

Using the standard lattice boom the T.10 can be equipped for grab, dragline or crane work.

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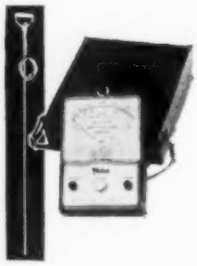

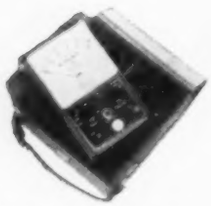

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- Accurately measures small field potentials to 50 MICROvolts.
- 8 full scale ranges from 0-25 millivolts.
- Accuracy ± 1½% on ALL ranges.
- 10 megohms input resistance AC or DC models

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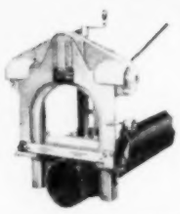
2" TO 72" CAPACITY



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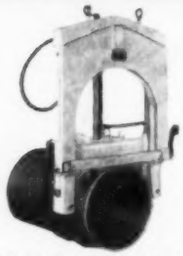
Electric or Air Drive



"BIG" GUILLOTINE SAW
10" to 16" Capacity

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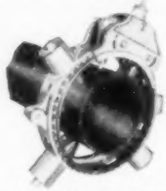
"The milling machine on wheels"
Cuts 10" to 72" Pipe



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"Lathe Type Cuts"
5 sizes—2½" to 24" Capacity

Write for descriptive bulletins

THE E. H. WACHS COMPANY
Manufacturers of Engines, Valves and Machinery since 1883
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Hazard Finder

Crouse Hinds Company offers an eight-page, illustrated "Hazard Finder" folder containing a check list of 13 questions to aid in determining whether uncontrolled flammable gases, vapors, dusts, liquids and other combustible materials are creating an unsafe plant. An evaluation of the hazard potential is revealed after all questions have been answered.

To get a copy, circle **No. E25** on Readers' Service Card, last page this issue.

Valve Line

A completely revised 43-page booklet covers the entire Rockwell-Nordstrom semi-steel valve line. Rockwell Manufacturing Company's new bulletin includes photos, drawings and detailed description of lubricants and lubricating methods and the working parts of four principal types of valves—two-bolt cover, screwed-gland, bolted-gland and multiport types.

For more data, circle **No. E26** on Readers' Service Card, last page this issue.

Water Vapor Recorder

The M-S-A continuous water vapor recorder for measuring low concentrations in streams of air or various gases for process industries or gas pipe lines is presented in a bulletin published by the Mine Safety Appliance Company. The publication explains and illustrates the principle of operation and gives typical applications.

To get a copy, circle **No. E27** on Readers' Service Card, last page this issue.

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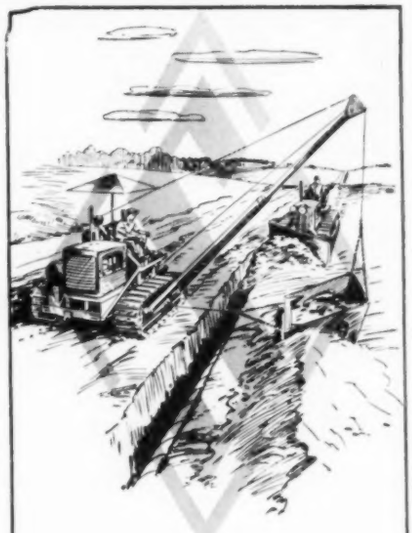

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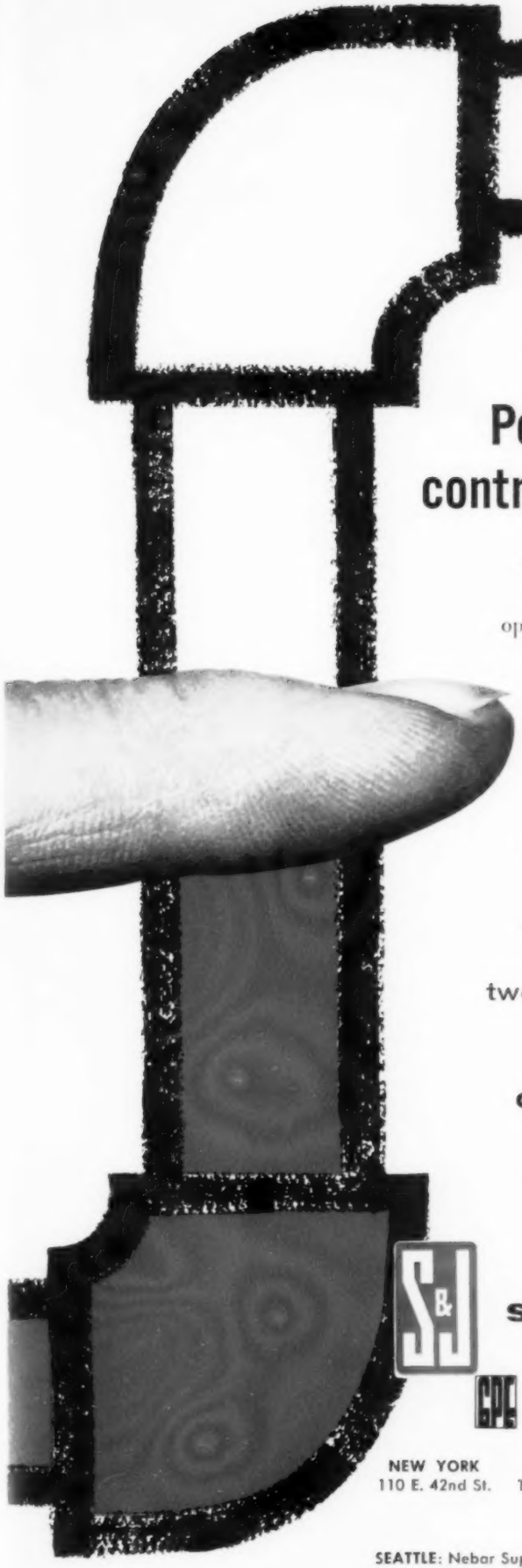

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